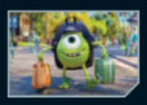

PIXAR ANIMATION
Senior animator Robb Denovan reveals his pro techniques

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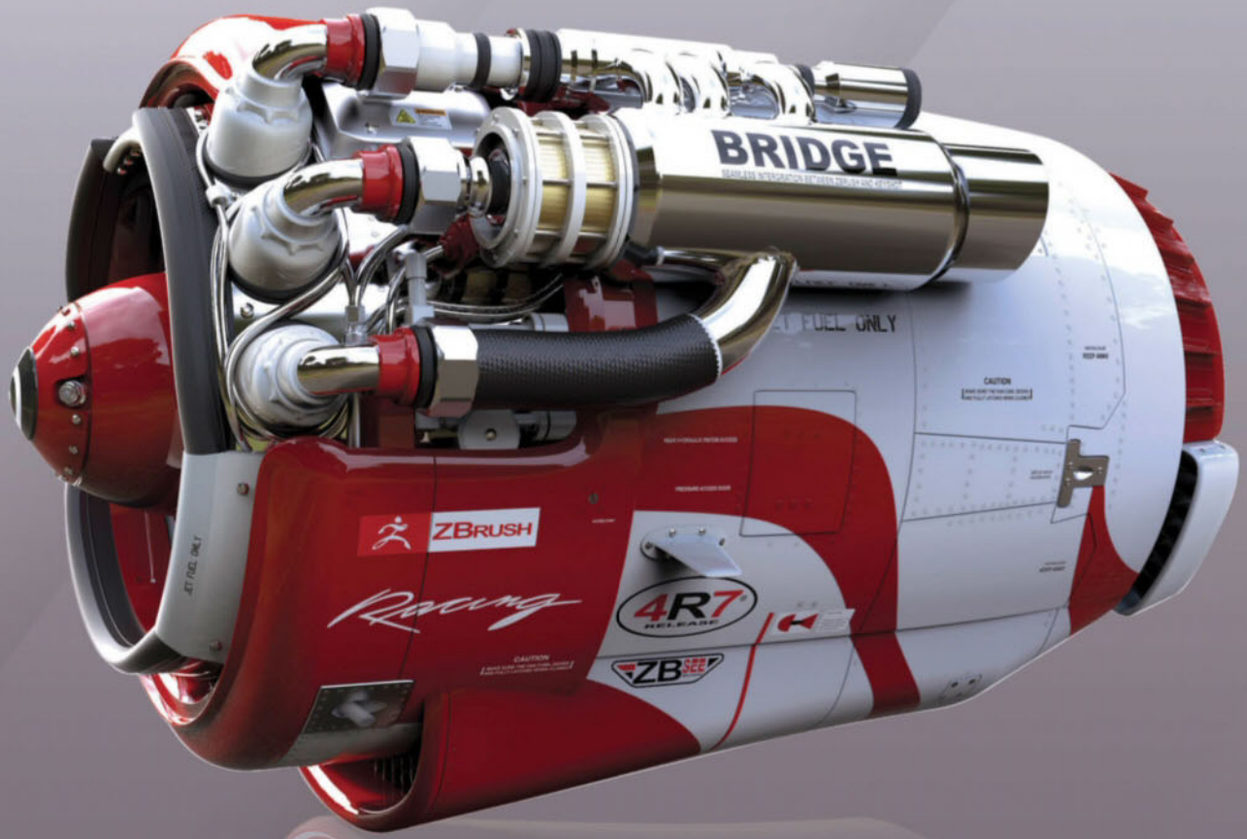

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Jay Howse
artstation.com/artist/jay_howse

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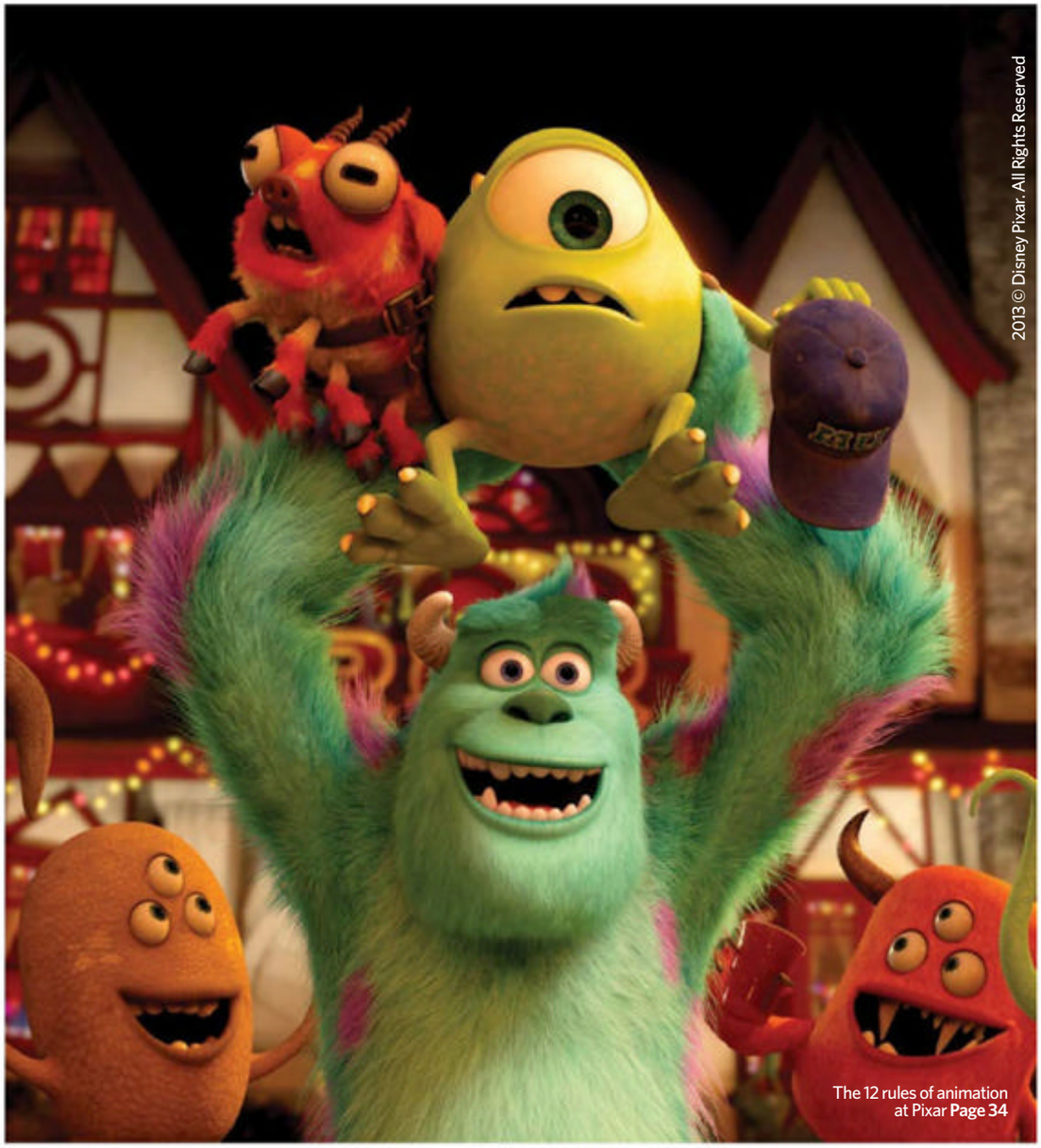
Posing the model is very important and can transform a plain sculpt into something lifelike and believable

Jay Howse explains his incredible approach to realism **Page 41**

Achieve Jurassic World quality page 40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The 12 rules of animation at Pixar **Page 34**

Welcome

To the magazine and 100 pages of amazing 3D

Welcome to **3D Artist**! It has been nearly 22 years since *Jurassic Park* was let loose upon audiences, capturing hearts and minds with its stunning visual effects. The VFX world has evolved significantly since then but many principles and approaches remained, and now we're faced with a new beast under the same banner – *Jurassic World*. In honour of its impending release, we've brought you an incredible dinosaur tutorial from Jay Howse to unleash your Maya potential.

Elsewhere in the mag we've been blessed with an animation masterclass courtesy of Pixar senior animator Robb Denovan, in which he reveals the legendary studio's approach to the art of bringing timeless characters to life. It's great to have Robb on board, and his feature starts over on p34.

And of course we've the usually bevy of incredible tutorials from some of the best in the business. I'm extremely pleased to welcome Scott Eaton back to the mag on p62, we've got the second part of Morro Images' modular backgrounds tutorial, Aldo Vicente returns with a steampunk blowout and Gustavo Åhlén gets industrial in SOLIDWORKS.

Plus, discover the 90 plugins, apps and hacks that will change your workflow forever on p24!

Steve Holmes, Deputy Editor

Sign up, share your art and chat to other artists at **www.3dartistonline.com**

Get in touch... 3dartist@imagine-publishing.co.uk @3DArtist Facebook.com/3DArtistMagazine

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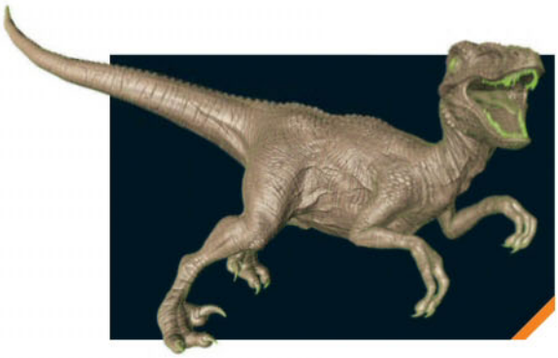
The Expert Panel

This issue's team of pro artists...



JAY HOWSE
artstation.com/artist/jay_howse

Jay is responsible for our incredible cover image and shows you how to create your own realistic, terrifying dinosaur over on p40. Learn how to achieve *Jurassic World* quality in your work!
3DArtist online username Jay Howse

ALDO VICENTE
aldovicentecg.com

We were really keen to get some more steampunk stuff in the mag after our Blender tutorial in issue 78, and so we got Aldo on the case. Check out his amazing insight starting on p46.
3DArtist online username AldoVicenteCG

SCOTT EATON
scott-eaton.com

We feel extremely lucky to be able to welcome anatomy master Scott Eaton back to **3D Artist**. This issue he shows you the ins and outs of totally accurate facial anatomy on p62.
3DArtist online username n/a

CHRISTIAN RESKI
morroimages.com

In the second part of our modular backgrounds tutorial from Morro Images, Christian reveals his texturing secrets in MARI. Don't forget to download the assets from both parts from **FileSilo** now!
3DArtist online username n/a

GUSTAVO ÅHLÉN
gustavoahlen.deviantart.com

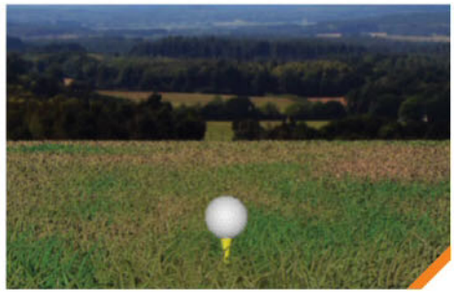
This issue, Gustavo has dived into SOLIDWORKS to explore some crucial industrial design techniques and CAD principles. His extremely useful tutorial begins on p70.
3DArtist online username gustavoahlen

ROBB DENOVAN
pixar.com

We're privileged to welcome Robb to the magazine this month. Head to p34 to read his key priciples for animation, honed over a long, fruitful time in the industry at companies like Pixar.
3DArtist online username n/a

SETH NASH
www.sethnash.com

Seth is a brilliant character artist and often works in videogames. We asked him to take a look at one of the best tools for games, the new Substance Designer. His expert review is over on p82.
3DArtist online username n/a



PAUL CHAMPION
ncca.bournemouth.ac.uk

Paul is back, but rather than effortlessly breezing through the most technical of compositing tutorials, he's taken a critical look at Maya 2016. Find out what he thought of the new features on p74.
3DArtist online username n/a

DARIJAN KALAUZOVIĆ
behance.net/Darijan_kal

Autodesk's other baby, 3ds Max, has recently enjoyed a substantial update for 2016 as well. Join Darijan on p76 as he meticulously picks apart the latest features and reveals his verdict.
3DArtist online username n/a

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90 Plugins, hacks and apps

"What I enjoy most about V-Ray in particular is its simplicity for getting great lighting quickly"

Rob Watkins on one of his favourite render plugins **Page 29**

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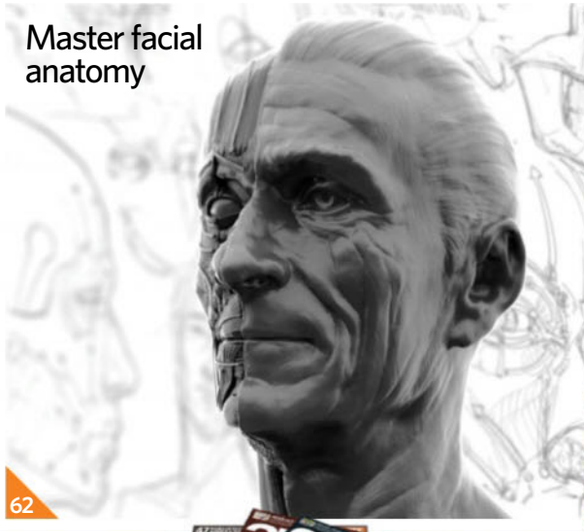

Master facial anatomy

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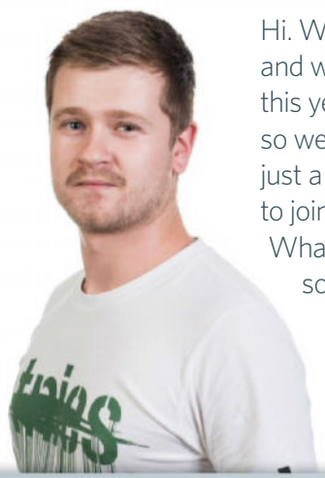
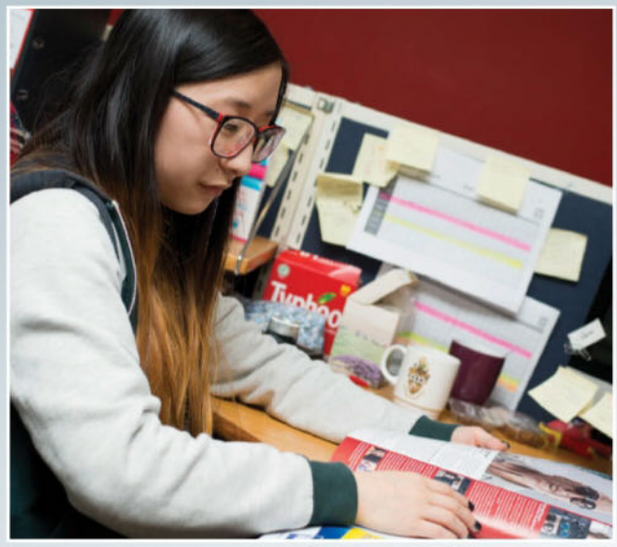
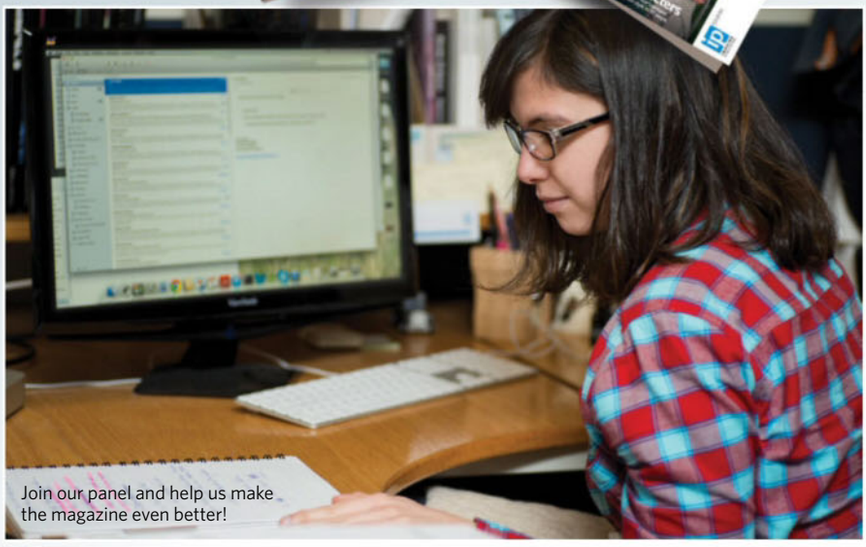


Hi. We absolutely love making 3D Artist and we hope you love reading it too. But this year we want to make it even better, so we're asking for your help. By answering just a few questions, you could be selected to join our first ever 3D Artist panel.

Whatever your skill level or discipline, I'm so excited to hear what you have to say about our CG coverage and can't wait to learn more about you.

Steve Holmes
Deputy Editor





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This image, with a romantic spring ambience, is a personal project from Caue Rodrigues. He created it using 3ds Max, Marvelous Designer, V-Ray and Photoshop for the post-production. The whole creation process took him about 2 weeks.
If you want to see more, check out Caue's homepage: **http://cauerodrigues.net/**

The Gallery

Have an image you feel passionate about? Get your artwork featured in these pages

Antonis Karidis
artstation.com/artist/roen911

Antonis is a self-taught 3D artist and pilot instructor. He has worked for the likes of Ubisoft.

Software Cinema 4D, Photoshop, MARI

Work in progress...

"I used to make, at an almost professional level, plastic model kits. It's something that gave me a bit of experience with Photoshop for making realistic textures for my 3D models. The breakdown of the 3D is similar to what I used to do with plastic models!"

Antonis Karidis, *Migs NATO reporting name: Fulcrum,* 2015

Andy Jones
andyjonescreative.com

3DArtistOnline username:
Andyjonescreative

Software ZBrush, Cinema 4D, KeyShot

Work in progress...

"My father read the story of the Green Man to me and always mentioned how disappointing the art was. He hated peaceful ones, as the Green Man was unfriendly to humans. So, here you go Dad"

Andy Jones, *The Greenman,* 2014

Øyvind Fiksdal
fxdal.com

Øyvind is a digital artist who is working for agencies in Norway and starting his own business

Software ZBrush, MODO, Photoshop

Work in progress...

"The bacon campaign was developed by McCann (Stian Birkelid and Jan Petter Ågren) and final retouches done by Fredrik Myhre. The campaign sheds light on it being better with bacon in water than water in bacon"

Øyvind Fiksdal, *Bacon in Water,* 2014

Ângelo Fernandes
angelofernandes.com

3DArtistOnline username:
angelofernandes

Software 3ds Max, V-Ray, Fusion, Photoshop

Work in progress...

"My idea was to create a minimalist house for a successful writer, who had given up dealing with people and passes all of his time writing"

Ângelo Fernandes, *Writer's home – office,* 2015

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Lucas Ribeiro Fernandes
lucasribeiro.tv

A CG generalist since 2004, Lucas aims to learn as many CG intricacies as he can

Software ZBrush, KeyShot, Photoshop

Work in progress...

"The image is a creature concept developed in Bryan Wynia´s workshop – that helped a lot when thinking about different ways to approach a creation"

Lucas Ribeiro Fernandes, *Mars Eagle,* 2015

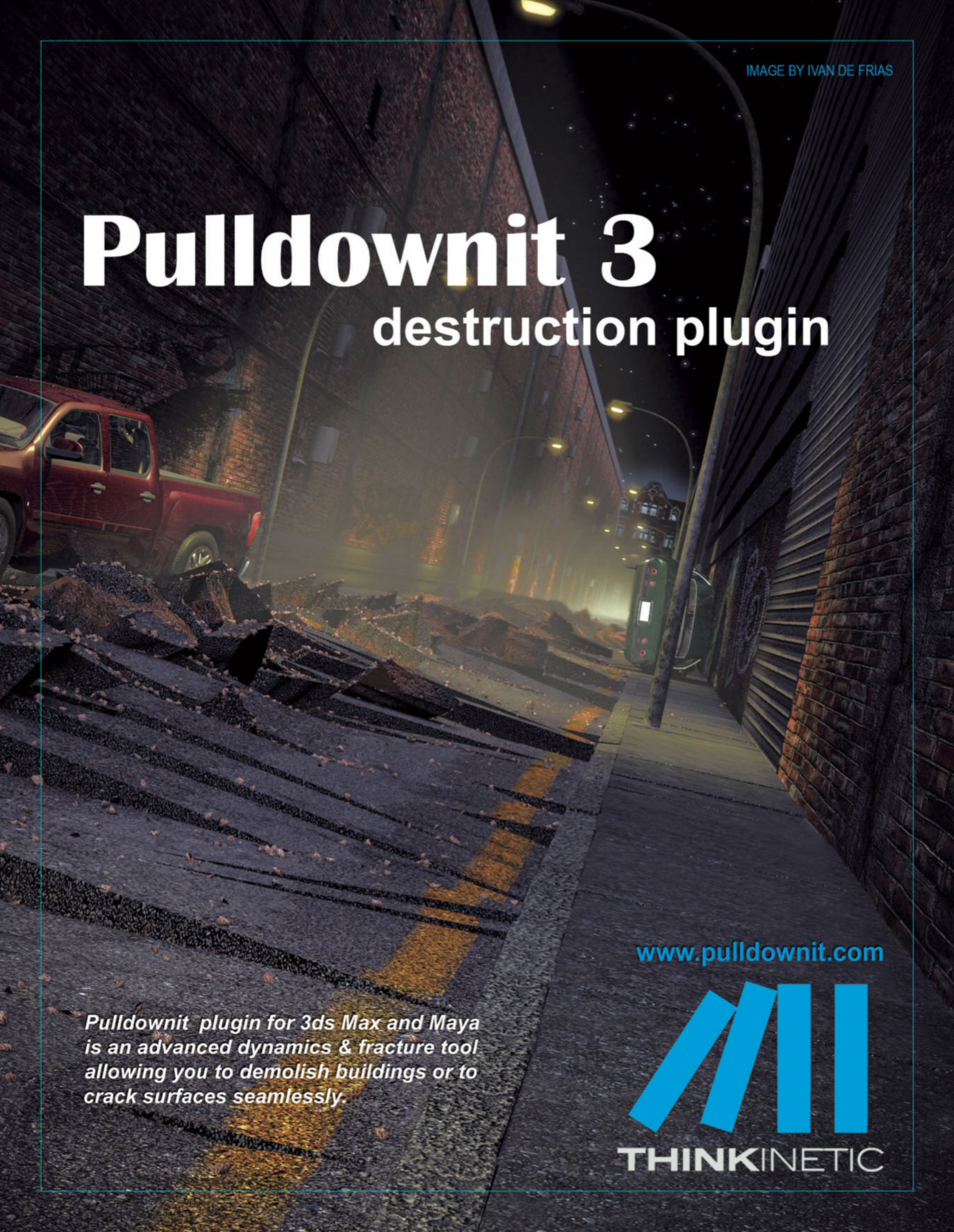
> I got started with references. At the beginning I decided to go with a flying creature and I started to pick some reptile references to mix with another kind of animal

Lucas Ribeiro Fernandes, *Mars Eagle*, 2015

CONCEPTS
I made some basic shapes in ZBrush that would help me design new ideas in Photoshop. I used Photoshop to paint over things, trying to figure out some new ideas and shapes.

PAINTING
With the design set, I decided to move back to ZBrush and finalise the modelling. Afterwards, it was time to think about the colours. As I was following reptile references, I really wanted that reptile look for my textures.

RENDERING
To render I used the newly released ZBrush to KeyShot Bridge, and the result could not be better – it provided a high-level finishing render that was fast and intuitive. I rendered out some passes and composed everything in Photoshop for the final piece.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90 PLUGINS HACKS APPS

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To help us pick, we've asked some of the best artists in the industry to join us in showcasing 100 of our best plugins, apps and add-ons for 3ds Max, Blender, Maya, ZBrush and Cinema 4D. So what are you waiting for – turn the page to find that scripted solution to all your problems!

Astral Projection by Chris Chui

EXPERTS

Jahirul Amin
jahirulamin.com
3D trainer at Double Negative

Hasan Bajramovic
hasanbajramovic.com
Freelance character artist

Daniel Banasik
etmed3d.blogspot.com
Freelance CG artist and motion editor

Ronen Bekerman
ronenbekerman.com
Founder of 3D arch-vis studio Polytown

Hugo Beyer
hugobeyer.artstation.com
Senior environment texture artist at Ready at Dawn

Gurmukh Bhasin
gurmukhbhasin.com
Concept artist at Cloud Imperium Games

Joey Camacho
rawandrendered.com
Motion and graphic designer

Chris Chui
artstation.com/artist/mxnarch
Freelance modeller and cloth FX artist

Stanislav Gorshenin
handfighter.deviantart.com
Freelance 3D artist with experience working on *Disciples III* and *Postal III*

Yasin Hasanian
superhero.cgsociety.org
CG artist

Mohsen Hashemi
psdesign-co.com
President of Phoenix Architectural Visualization group

Mark Masters
digitaltutors.com
3D generalist

Alireza Milani
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Freelance 3D Artist

Pablo Muñoz
pablander.com
Freelance 3D Artist

Kate Pfeilschiefter
katepfeilschiefterart.com
Concept artist and illustrator

Andrew Price
blenderguru.com
Creator of training hub BlenderGuru

Kenny Roy
kennyroy.com
Director of Arconyx Animation Studios

Miles Sebesta
milessebesta.com
3D character animator

Daniel Sian
danielsian.com.br
Freelance 3D artist with clients like LG

Igor Sobolevsky
igoq.artstation.com/portfolio
Designer and concept artist

Ian Spriggs
ianspriggs.com
3D artist, known for incredibly realistic human portraits

Rob Watkins
wokosworld.com
Concept artist, worked on the *Fable* series

Jonathan Williamson
cgcookie.com/blender
Head Blender artist at CGCookie

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04 Greeble
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05 Image Composition Helper
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A legendary script for randomly distributing a selection of objects. Great for grasses, hair and fur, and stones and pebbles. There's even a toothpaste generator option!

07 RailClone
itoosoft.com/railclone.php **€200 inc VAT for one-year subscription or free Lite version**
Generate complex parametric objects including fences, stairs and floors faster than ever before.

08 Relink Bitmaps
colinsenner.com/scripts/relink-bitmaps **Free**
Easily relink missing files like bitmaps, VRayMeshes, mental ray proxies and VRayHDRI when they change directories or when you move computers.

09 Ornatrix
bit.ly/1d8ng9P **$499**
This professional hair and fur plugin for 3ds Max is renowned for its quality and functionality, and it has been used at studios like Unit Image and Blur.

10 MultiScatter
multiscatter.com **$235**
Create a scene with 500,000 objects at only 250KB right before rendering with this great tool.

11 Multimesher
kinematiclab.com **Free**
Intersect or subtract different meshes together using multiple sources and Boolean operations, perfect for adding instant interest to your model.

12 Unwrella
unwrella.com **€149**
Very few 3D artists like unwrapping UVs, but Unwrella is here to help – a powerful plugin for both Maya and Max that unwraps UVs in minutes.

13 Regularize Edge Loop
bit.ly/1QqQsby **Free**
Incredibly useful script for turning your poly selection into a circle. Works with edge loops on planar and curved surfaces as well as cross-sections. It accepts multiple loops at once too.

14 DreamScape
bit.ly/1EmcFm0 **$645**
Create sky, terrain and realistic sea surfaces including reflections, refractions, bump mapping, foam and underwater scenery.

15 MadCar
rendering.ru/ru_en/madcar.html **€200**
A great plugin for quickly rigging wheeled vehicles and supports any number of wheels, from a motorcycle to a lorry.

16 FloorGenerator
cg-source.com/floorgenerator.php **Free**
An incredible arch-vis script that generates floor objects made of individual boards – works with MultiTexture: cg-source.com/multitexture.php.

BEST FOR FX

17 FumeFX
afterworks.com/FumeFX/Overview.asp $845
Also available for Maya, Sitni Sati's plugin for smoke and fire simulation has been production proven in films such as *Thor*, *Iron Man* and *Hugo*.

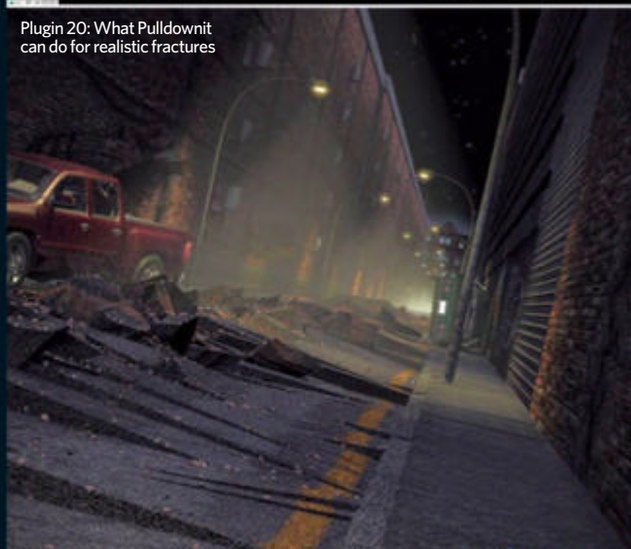
18 thinkingParticles
cebas.com From €45 per month
This is one of cebas' flagship plugins, known for procedural and physically accurate destruction and special effects simulations. It's been used in blockbuster films like *The Avengers*, *Captain America* and *Star Trek: Into Darkness*.

19 RayFire
rayfirestudios.com $130 for an educational licence, $385 for full commercial licence
Fragment, destroy, blow up and do much more! Used to help create *Diablo III* cinematics and *Transformers: Dark Of The Moon*.

20 Pulldownit
pulldownit.com From €395
Also available for Maya, this dynamics solver creates realistic fractures as well as massive rigid body simulations. An ideal plugin for earthquakes!

Plugin 01: *Multipurpose Skyscraper* by Mohsen Hashemi

Plugin 24: Maya from inside Oculus Rift with mOculus.io



Plugin 20: What Pulldownit can do for realistic fractures

Plugin 23: Anatomy Study *The Dying Gaul* by Ian Spriggs

MAYA

21 SpPaint3D
creativecrash.com/maya/script/sppaint3d **Free**
Spreads and scatters your objects through painting.

22 Rapid Rig
creativecrash.com/maya/script/-rapid-rig-advanced-auto-rig-for-maya **$40**
A powerful autorigging plugin for Maya, perfect for speeding up what is normally a very time-consuming process.

23 The Setup Machine
anzovin.com/tsm **$99**
This character rigging plugin produces a high-quality skeleton and proxy, control rig, and basic but accurate skin weighting for models in a few clicks.

24 mOculus.io
moculus.io **From $65.55**
This Oculus Rift plugin for Maya enables you to create 3D work directly in VR, aiming to add more immersion into the creation process.

25 ZenTools
creativecrash.com/maya/script/zentools **Free**
A great combination of tools for modelling, selection, UVLayout, hair and character setup.

26 Golaem Crowd
golaem.com **From $1,980 for three months rental**
Artist-driven crowd simulation to get an army of soldiers or a horde of zombies in no time. Used in *Game Of Thrones*, *Hercules* and more.

27 Miarmy
basefount.com/miarmy.html **From £895 for three months rental**
Great for crowd simulation, AI and behavioural animation, creature physical simulation and rendering. Lots of training and tech demos included.

28 Joint Splitter
bit.ly/1Gpxy1O **Free**
This free rigging tool enables you to add additional joints between two other joints with precision.

29 Elementacular
elementacular.alexandra.dk **$175**
Create volumetric clouds and control the cloud shape by manipulating its underlying geometry.

30 My Merge Vertex
bit.ly/1DGy5p8 **Free**
Easily collapse and merge many vertices at the same time by setting distance. Very useful for whenever you create half a model and need to mirror and connect together both halves.

31 froTools
froyok.fr **Free**
An excellent toolset developed specifically for working faster with goodies for modelling, selection and an enhanced UI.

32 Qtown
creativecrash.com/maya/script/qtown **Free**
Generate a procedural city. Even simple geometry can look like more complex buildings, which now come with automatically generated UV coordinates.

33 Zootools
macaronikazoo.com **Free**
This set of open source scripts have been developed by programmer and animator Hamish McKenzie, and they aim to help both riggers and animators in their everyday lives.

34 FaceShift
faceshift.com/maya **Free**
Stream live facial performances or import recorded performances directly into your character rig.

35 alShaders
bit.ly/1HvwEB9 **Free**
A fantastic production shading library for Arnold developed by Anders Langlands, who is now a Solid Angle employee.

36 Comet Scripts
comet-cartoons.com/melscript.php **Free**
A selection of free Maya MEL scripts to help riggers along the way.

37 Autodesk Maya bonus tools
area.autodesk.com/bonus_tools **Free**
Every Maya user should know about this free collection of Maya scripts and plugins from Autodesk.

38 Studio Library
studiolibrary.com **Free**
A completely free Python script for managing your animation clips and poses.

39 UNFOLD3D
polygonal-design.fr **From €299**
Now included as standard inside Maya 2015 and up, Unfold3D is a powerful program for creating fast UVs with minimum effort.

40 ngSkinTools
ngskintools.com **Free**
Character skinning plugin for Maya that gives the ability to smooth weights with no strange artifacts, undo/redo problems, mirror weights without needing to go to a T-pose and more.

BEST FOR ANIMATION

41 tweenMachine
justinsbarrett.com/tweenmachine **Free**
The easiest way to create breakdowns between key poses in Maya, excellent for any animator.

42 MgTools
mgland.com/MGtools_en.html **From €60**
A toolset made especially for character animators to get your best acting performance yet.

43 Blue Pencil
bit.ly/1DGy9oY **$49 per licence, free demo**
Bring advanced 2D drawing to your 3D workflow and Maya's viewport with the help of this plugin. Blue Pencil includes many more features than Maya's native Grease Pencil.

44 bhGhost Tool
graphite9.com/MayaDownloads.html **Free**
The bhGhost animation tool provides a whole new approach to ghosting for animators, where only the outline of the character is shown in different frames so that the spacing of the full animation is much easier to see and distinguish.

Plugin 60: *Using IvyGen in Blender* by Andrew Price

ZBRUSH

45 UV Master
pixologic.com/zbrush/features/UV-Master **Free**
UV creation has never been so easy with this add-on that comes directly within ZBrush itself. Make UVs with just one click!

46 RefBoard
bit.ly/1Ok4dKq **Free**
Designed to always stay on top of whatever software you are currently using, this image viewer lets you add, arrange and resize any images you like to a saveable board.

47 Transpose Master
bit.ly/1zTP9aG **Free**
Available directly within ZBrush, Transpose Master is designed to help you pose a model composed of subtools, ready for rendering.

48 GoZ
pixologic.com/zbrush/features/GoZBrush **Free**
Easily transfer files between applications like Maya and Cinema 4D, without setting up shading networks. A huge workflow speed-up!

49 Mask Grow
bit.ly/1GeuGiR **Free**
This script will let you grow your mask in ZBrush, similar to growing a selection in Photoshop.

50 ZAdjustor 2.0
bit.ly/1KnN4ty **Free**
Adjust Draw Size, Focal Shift, and Z/RGB Intensity by simply moving the mouse or stylus on the x and y axis while holding down a hot key.

51 PaintStop
pixologic.com/zbrush/features/PaintStop **Free**
PaintStop is a 2D drawing program that works based on the use of real-life art tools such as pencil, charcoal, pastel, marker and many more right in the heart of ZBrush.

52 Multi Map Exporter
bit.ly/1ONHDVH **Free**
Included in ZBrush is Multi Map Exporter, designed to automate map creation and export them for your model with settings that can be saved and reloaded for next time.

53 NanoTile textures
bit.ly/1Hzn3I3 **Free**
This unofficial plugin by Joseph Drust lets you make seamless tiling textures using NanoMesh indexes.

54 Decimation Master
pixologic.com/zbrush/features/decimation **Free**
One of the fastest ways to reduce the poly count of your models without losing any details – very useful for reducing render times for still images.

BLENDER

55 Amaranth
pablovazquez.org/amaranth **Free**
Created by Blender Foundation certified trainer Pablo Vazquez, these tools let you toggle to low-res preview mode, refresh scenes and more.

56 Node Wrangler
bit.ly/1Hzpjz2 **Free**
A variety of tools for working more efficiently than ever before through the use of node setups.

57 Start Cube Modelling
wahooney.net/category/addon **Free**
Speed up modelling with this add-on, which will create a cube, slice half of it, add a mirror modifier, enable clipping and take you into edit mode.

58 Asset Sketcher
bit.ly/1Ok5G3s **$29.95**
A Blender add-on that lets you paint objects directly into your scene for plenty of intuitive detail.

59 Gaffer – Light Manager
bit.ly/1DqDDoA **$17.95**
Easily light your scenes with a simple interface, presenting you with all the lamp settings you need to tweak in a panel.

60 IvyGen
bit.ly/XWJNz5 **Free**
Quickly generate basic ivy to crawl across a wall or natural environment – useful for detailing arch-vis.

61 GoB
bit.ly/1DjeFpW **Free**
Easily transfer textures and meshes between Blender and ZBrush.

62 RetopoFlow
bit.ly/1JAVNYt **$71.25**
Retopology tools designed for artists! Enables you to retopologise models directly in Blender.

63 Add Mesh Toolkit
bit.ly/1Ok616f **Free**
An epic script bundle that lets you add quick meshes to your scene, including ladders, pipes, gears and circular stairways.

64 Blender Camera Calibration
bit.ly/1DqEqG5 **Free**
An open source add-on to calibrate your virtual 3D camera so that its orientation and focal length match the camera used for a given reference photo.

65 Sapling
bit.ly/VfDnZS **Free**
Generate realistic parametric trees according to a method developed by Jason Weber and Joseph Penn in 1995.

66 BookGen
bit.ly/1JAWMYB **Free**
Generate books in Blender to quickly and easily fill shelves or cupboards.

67 Dynamic Spacebar Menu
bit.ly/1PtNbXB **Free**
Increases the functionality of the Spacebar for easy access to commonly used tools and features.

68 Blender Muscle tools
cgcookiemarkets.com/blender/all-products/blender-muscle-tools **$19.95**
Create muscles in Blender to make your rigs and animations more realistic than ever before.

69 ANT Landscape
wiki.blender.org/index.php/Extensions:2.6/Py/Scripts/Add_Mesh/ANT_Landscape **Free**
Generate procedural mountains and landscapes, great for adding to the backdrop of any scene.

70 Sculpt Tools
blenderartists.org/forum/showthread.php?316520-Sculpt-Tools **Free**
One of the best sculpting add-ons you can get, modified by Blender Cookie's Kent Trammel.

71 Archimesh
bit.ly/1EdqnGl **Free**
Quickly create accurate whole house structures with all the correct measurements, including walls, doors, columns, stairs and tiled roofs.

RENDER PLUGINS

72 V-Ray

What I enjoy most about V-Ray in particular is its simplicity for getting great lighting quickly. I also often use simple AO renders in V-Ray to check the model and details. Also the material resources are available to users online: it's all free, and great for getting an idea of how everything looks before you go in and build it or paint it in Photoshop. **Rob Watkins**

V-Ray is definitely my favorite Max rendering engine. Without it, things would be harder. **Hasan Bajramovic**

73 Arnold

Hands down the most straightforward renderer I've worked with! Robust and easy to use for both artists and developers. **Yasin Hasanian**

74 RenderMan

The Academy Award-winning software tool, RenderMan, was first developed by well-known animation studio Pixar. Now with the release of the RenderMan 19 plugin for Maya you can now render non-commercial art freely and without any limitation or watermarks affecting your work. RenderMan for Maya is a very powerful render engine indeed. **Alireza Milani**

75 OctaneRender

GPU rendering brings the power of thousands of parallel cores to work on calculating your final images. These days, GPU rendering brings all the bells and whistles of a CPU render, such as motion blur, depth of field, accurate reflections and refractions, and global illumination. With the massive amount of time saved using a GPU render, you can use the extra production time to try to meet your clients' expectations. **Kenny Roy**

Axiom Jet Racer 'Hero Shot' by Igor Sobolevsky

CINEMA 4D

76 Enhance: C4D
biomekk.com **$99**
This set of 178 procedural 2D and 3D shaders for Cinema 4D provides the creation of an infinite number of textures, patterns and surfaces.

77 Reeper
bit.ly/1GeAYPN **Free**
Create ropes or any other similar structures along splines with this great plugin. Fantastic for any abstract motion-graphics work.

78 Magic Snow
nitro4d.com/blog/freebie/magic-snow **Free**
Make snow effortlessly straight inside Cinema 4D.

79 Nitroblast
nitro4d.com/blog/donationware/nitroblast **€40**
A great fracturing plugin from the creator behind Thrausi and Catastrophe. Provides completely automatic collision driven fracturing.

80 Smart Poly Chart
bit.ly/1GeBs8g **Free**
Draws a neat bar chart containing every single polyobject in your scene, beginning with those that have the highest polycounts. Handy for organising and optimising large scenes.

81 VUE
e-onsoftware.com/products/vue **From $199 for Vue Esprit**
Also available for Maya, 3ds Max and more, this is a professional solution for realistic digital nature.

82 Arrow Toolkit
olivervogel.com/work/view/13 **Free**
Quickly and easily create arrows of any size along any spline you want.

83 X-Particles
3.x-particles.com **From £150**
One of the most advanced particle simulation and rendering environments around, enabling you to generate up to 1 billion particles.

84 City Kit
store.greyscalegorilla.com/products/city-kit **$149**
Build realistic cities that can be customised with a single click.

85 Xpresso Floor Generator
josefbsharah.net/xpresso-floor-generator **Free**
Create random, seamless, realistic floors.

86 Voxygen
cinemaplugins.com/c4d-plugins/voxygen **£46.70**
A procedural voxel generator to get that cool old-school, pixelated cubes look. Transfers your UV coordinates onto voxels for supereasy texturing.

TOP PICKS

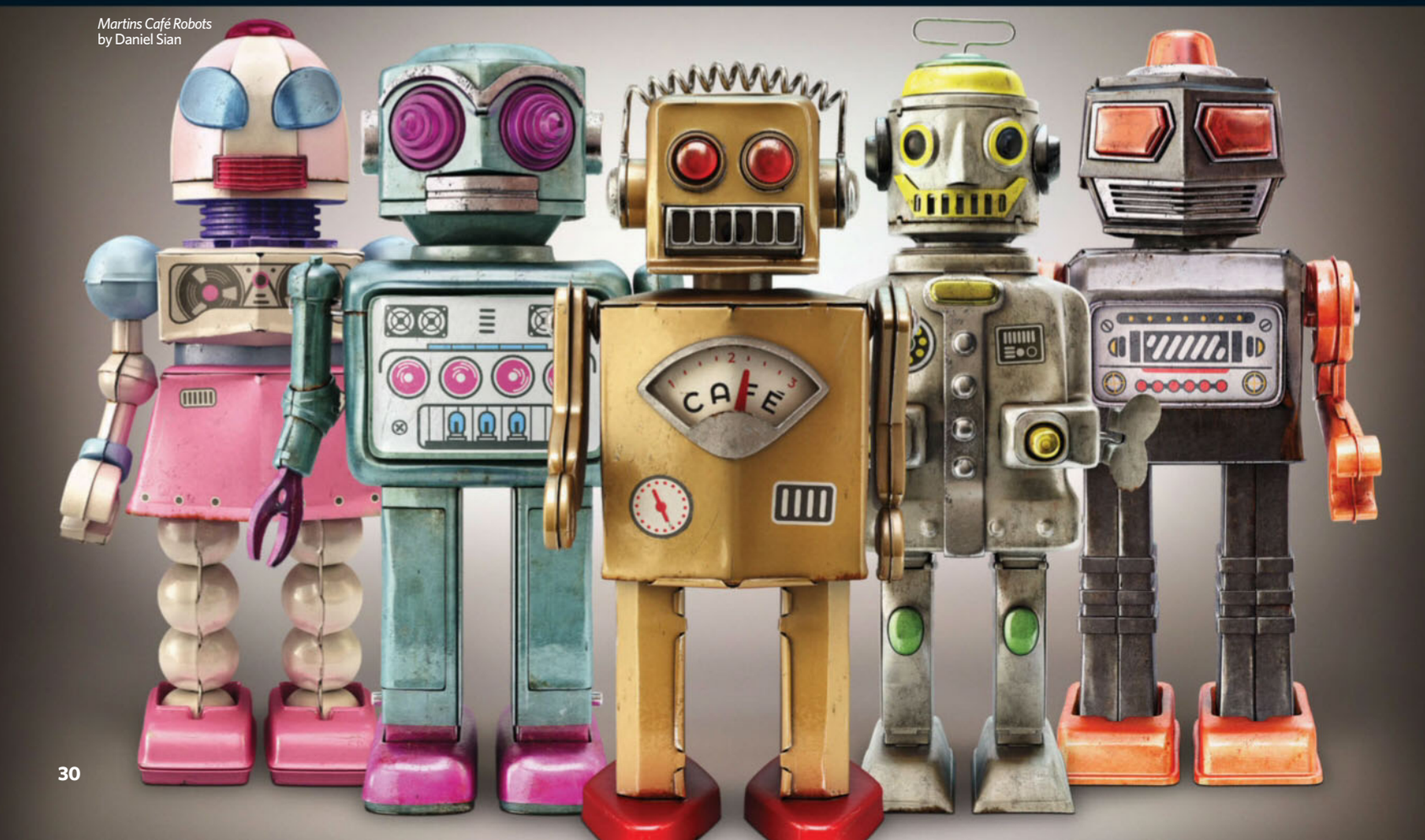
87 Hangover
bit.ly/1I3taou $24.99 pro version
This nifty plugin will notify you via email or text when your render is done, and it can even automatically shut down your computer after.

88 Microfloaties
joelotron.com/microfloaties Free
Add floating dust particles to your scene and control the amount, size and speed of them in your render as well as the scale of the area they occupy.

89 KRAKATOA
thinkboxsoftware.com/krakatoa Request an evaluation licence
KRAKATOA is also available for 3ds Max and Maya and is perfect for rendering millions of particles at unprecedented speed for the perfect dust, smoke, ocean surface foam and more.

90 HDR Light Studio
hdrlightstudio.com Commercial single licence £299
Also available for 3ds Max, Maya, Houdini, MODO, and more, HDR Light Studio enables you to easily customise HDRI environment maps or simply create one from scratch for professional lighting.

Prices correct at time of going to print on their respective websites and subject to conversion rates.



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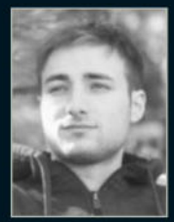
Technique focus

Incredible 3D artists take us behind their artwork

MODELLING This kangaroo mech is just an image I did for fun so that I could test out a variety of new techniques. The mech was mostly modelled with the help of two programs – 3ds Max and ZBrush – then the kangaroo mech was rendered in V-Ray, with post-production done later using Photoshop.



Gavriil Klimov
gavriilklimov.com

Gavriil is a freelance 3D concept designer working in movies, games and product design

Software 3ds Max, ZBrush, V-Ray, Photoshop

Kangaroo Mech, 2013

man machine

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PIXAR
THE 12 RULES OF ANIMATION

Pixar's senior animator, Robb Denovan, looks at the studio's animation techniques in depth and explains why they're still relevant today

Working at Pixar is a great opportunity to learn and hone skills as an animator, as Robb Denovan explains: "Whilst there are many great tools and tricks that are specific to Pixar and their software, I find myself adhering to the same principles that have been around since the early days. One of the most revered books in animation is *The Illusion Of Life* and I am constantly referencing it as a guideline for my work. At Pixar, we are constantly trying to push the envelope with our animation but at the same time we pay homage to the original animators and the principles they developed.

"We will talk about 12 key components for things that I try to include when animating. Some of the topics I will discuss are from *The Illusion Of Life* and other topics are things that I have discovered along the way that I find valuable when animating."

THE PIXAR WAY

Three of Robb's key films include Brave, Monsters University and Inside Out

"Since arriving at Pixar, I have had the opportunity to work on many great films at the studio including *Brave, Monsters University* and the upcoming film, *Inside Out*. My first project was the animated short film 'La Luna', which tells the story of Bambino, a young boy coming of age in the most peculiar circumstances. I was given the task of animating the crucial shot of Bambino climbing a ladder and floating to the Moon. I also animated several key scenes in *Monsters University* involving Mike and Sulley, including the main confrontation between the two characters. One of the most enjoyable shots I animated was of Don Carlton, the 'mature' student and president of the Oozma Kappa. In the scene, Don dances across the dancefloor at a sorority party. I shot a lot of footage of myself dancing really poorly and embarrassingly had to show the director my reference footage for approval!"

All images © Disney Pixar

01 Squash and stretch

"Considered one of the cornerstones of animation, squash and stretch is what breathes life into a character. Without squash and stretch, all of our characters would appear stiff and rigid. Even seemingly rigid characters and objects should have an element of squashing and stretching applied. Squashing and stretching also demonstrates the weight of a character. And it's not just the body of a character that can be stretched; I squash and stretch everything on a character like the eyes, hands and feet!

"Most animators have at one point or another animated the ubiquitous bouncing ball, but it is ubiquitous for a reason... every character in animation is more or less a bouncing ball! Observe the way a cheetah runs and you'll see an abundance of squashing and stretching. Though the cheetah's volume is actually staying the same, the cheetah's body is giving the illusion of squash and stretch. One of my favorite things to do is to frame through classic Disney films and see how the old masters cleverly used squash and stretch to bring life to the characters. Here at Pixar, we believe in the philosophy that it is more important to feel the squash and stretch than it is to see it."

02 Posing, silhouettes and lines of action

"Posing is one of the key factors in animating. A strong, clear pose gives the audience clarity and offers us, as the viewer, an insight into the character's thoughts and motivations on screen. Strong posing can also tell us a lot about the physicality of a character; like if they are heavy or light, tired or alert, strong or weak.

"Depending on the length of a shot, an animator may have less than a second to convey the emotion of a character to the audience. Instances like this are perfect examples of why a strong pose is important. There are many factors that influence a strong pose but two of the most important for me are clear lines of action and a lucid silhouette. There can be all sorts of elements in the pose that lead our eye to the intended focus point."

03 Timing

"Timing is a critical part of animation and is the one aspect that often gets overlooked by animators just starting out. Although posing may come across as the main component of animation, I would argue that timing can provide the viewer just as much emotion, attitude, personality and weight as a strong pose.

"For example, pretend you have two identical bouncing balls in your scene. If your task was to imply that one ball was extremely heavy and the other extremely light, it would be difficult to differentiate between the heavy ball and the light ball. This is where your timing and spacing of your animation sells the difference in the two balls. Not only does timing tell the audience about the weight of a character, it also helps sell the emotion of a character. Take a standard walk cycle. If the timing is very snappy and fast, this could imply that the character is nervous or energetic. Conversely, if your timing is very slow and evenly paced, one could assume that the character may be lethargic, sad or fatigued."

04 Research and reference

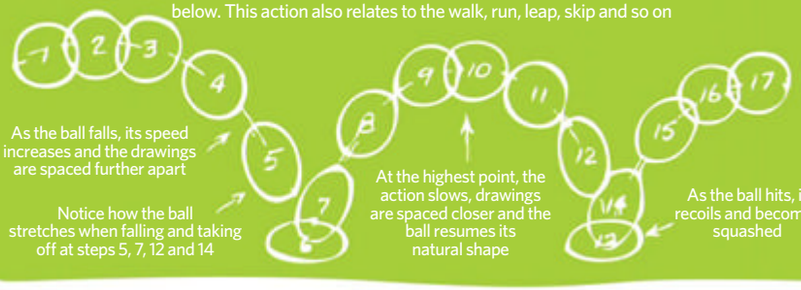
"I want to clarify that research and reference are two different thing. Research is a critical component of animation that happens in the early stages of animation. You need to fully know your character and the environment before immersing yourself in the animation. My first feature film at Pixar was *Cars 2,* and for research the animation team went out to a racetrack and got to drive race cars with professionals. The drivers were instrumental in teaching us about the mechanics of what a car is doing when it drives around corners, skids, accelerates and so on. Whilst watching footage of race cars has its merit, researching and understanding how cars work was instrumental in creating realistic and believable car chase sequences in *Cars 2.*

"*Brave* also required an extensive amount of research into a wide array of actions including archery and horseback riding. Until you actually attempt to release an arrow from a bow, you don't realise how hard archery can be! But by understanding how to hold a bow and arrow properly and researching the correct technique, I was able to approach scenes with archery with full knowledge of how it should look when animated.

"Reference is an extremely integral part of animating a shot at Pixar. Having reference footage available enables me to analyse movement and motion in a detailed and precise way. Another great thing about reference footage is I can frame through a clip or play it at half speed, which enables me to observe subtle nuances in a performance. These nuances can often add much needed texture to a shot and bring it to life. There are several different sources of reference that I use on a daily basis: online clips from sites like YouTube and BBC Motion

THE BASIC BOUNCING BALL ACTION

The ball follows a definite path of action: study the spacing of the ball along this path. Notice the similarity of the ball action to the hop and jump below. This action also relates to the walk, run, leap, skip and so on



© Preston Blair

Brave, one of Robb's key films, won many awards including an Academy Award for animation
© Disney Pixar

Gallery are great places to find specific actions or clips that will benefit your work. Movies and television shows are also great sources of inspiration. Certain actors have great mannerisms that lends themselves to animation. Filming yourself is possibly the most beneficial form of reference footage because you can tailor your performance to the dialogue in your scene and you can always take something away from filming yourself. When I film myself acting out a scene, I try to get in character as much as possible and physically embody the person or thing I am acting out. You may feel silly acting it out in front of a camera or mirror, but trust that only good things will come from analysing that footage!"

05 Developing an idea (acting)

"Acting is one of the most subjective parts of animation and can easily be one of the most frustrating! But as the story goes, animators really are just introverted actors. When an animator is given a shot, the worst thing that they can do is rush straight into the computer and start animating. If given the luxury, let the shot sit with you for a few days and really spend time fleshing out what you want to get across in the shot. Some of my best ideas for a shot happen on my walk home from work when I am away from the computer and distractions at work.

"Think about what you are trying to say. Don't think about actions but think about motivations. And don't ask *how* a character is doing something, but ask *why* a character is doing something. These are two completely different things. One of the most important things I've learned with acting is understanding subtext and the true motivations behind a character. Break down the dialogue and hunt for the true emotion in the shot. Humans are complex creatures and we are able to convey a wide range of complicated emotions all at once."

06 Blocking out a shot

"Once we have committed to an idea that we have for our shot through either thumbnailing or shooting reference footage, it is now time to block out our shot. One important thing I have learned since joining Pixar is that there really is no right or wrong way to block out a shot so long as your idea is conveyed clearly to the director.

"The first thing I do when starting to block out a shot is decide where the appeal is coming from and what I want to get across to the director: will the appeal come from strong posing or is the appeal of the shot all in the timing and rhythm? Understanding this will help me with my plan of attack. There are two basic methods that I use to block out a shot: 'pose to pose' and 'layered' animation – each with their own purpose and benefit. One can argue that a great shot has both which is undoubtedly true, but what I am concerned about in the beginning is getting the director to buy off on my idea and the easiest way to establish clear blocking. As a general rule, if the character isn't moving around that much in a scene, I will focus on strong poses and clear readability and if the characters are moving around a lot or there's choreography to work out in the shot I will block out using a layered method of blocking."

07 Polishing a shot

"After my blocking has been approved by the director, it is time to polish a shot and bring it to completion. This is the final stage of animation. At this point, my job is to start smoothing out paths of action, smoothing my curves in the graph editor and building on the foundation that I laid in place with my blocking.

"When polishing, I'm now starting to refine my poses and timing so that it clear and precise. I'm spending a lot of time on the intricacies of the character with things like fingers, eyelids, eye direction, costume and so on. This is when I spend most of my time in the graph editor manipulating my curves and massaging my slo ins and slo outs. I'm also adding in little flourishes and accents in my performance that I didn't include in my blocking passes. A word of caution: don't oversmooth your animation. In many cases, there is appeal in the messiness of your curves. Try smoothing it out but if it ends up looking too CG, revert back. I want to make sure that I don't lose the essence of what is working with my blocking."

Robb's latest work can be seen in *Inside Out*, released in June
© Disney Pixar

FROM SKETCH TO CINEMA

The quintessential stages taken to create a scene in Monsters University

The sequel to *Monsters, Inc.* stormed our screens in 2013, and with it introduced new techniques like ray tracing and global illumnation to Pixar. Take a look below at a CG pro's typical working steps for a film like *Monsters University.*

STORY

ART

MODELLING

LAYOUT

ANIMATION

LIGHTING & FINAL FRAME

All images © Disney Pixar

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To properly animate Merida's archery pose, Robb undertook extensive research © Disney Pixar

08 Familiarising yourself with studio tools

"Every studio has its own particular set of tools that can prove to be a valuable source of knowledge for animators and Pixar is no different. It is very easy to develop your own method for animating and become complacent and comfortable in your workflow but I would strongly encourage to try new tools that the studio offers. Ask your other animators what tools they use and what hotkeys they couldn't live without and try implementing these into your workflow. It's important to remember that these tools are designed for the animator's benefit to improve work productivity and efficiency.

"On a similar note, if you have an idea for a tool that would help improve an animator's day-to-day workflow, it is always worth talking to the tools or the rigging department to see if your idea is worth implementing. Some of our best tools at Pixar were designed by animators wanting more from the software and rigs."

09 Thumbnailing and note taking

"Thumbnailing is something that I have done since starting out in animation. I find it to be second nature when it comes to exploring ideas and thoughts about my shot. A common misconception is that you need to create perfect drawings. My thumbnails are messy and very basic but they are important for me to figure out what I want to animate. Another thing that I find helpful is writing out a lot of notes about my shot. I write notes for everything! I write about the character's motivation, I write about the physics of what is happening and I write about the character's subtext. This is something that helps me work through problems and questions that may arise once I start animating.

"Once in the shot, I will always refer back to my thumbnails and notes to make sure that I am not deviating from my original plan. I have heard countless animators say that they don't need to write down their ideas, but I personally find the act of writing it down a good practice and a solid reference point once animating."

10 Critical eyes

"One of the worst things you can do as an animator is burrow yourself away at your desk and not show your work to peers and coworkers. With hard deadlines and a tight schedule, it is easy to get into a pattern of closing your office door, putting on your headphones and animating. Even though your ideas may be great, showing your work to others may produce even greater results. Speaking from personal experience, my eyes start to go blind after working on a shot for too long and I'm unable to see mistakes that I would normally be able to pick up. By showing a co-worker, I'm able to get a new perspective on my work. If you were to give 100 animators the same scene, you would wind up with 100 different takes. By reaching out to others, you can only benefit from someone else's point of view regardless of whether or not you agree with their notes. Find those peers whose work you admire and pick their brain, get constructive criticism and learn from them."

11 Generating an effective workflow

"Generating an effective workflow is something that is often overlooked when discussing animation but can have a huge impact on your overall work productivity. I like to keep my workspace clear of any distractions. When animating, I force myself to work in an order that maximises efficiency. I start with the big ideas and resist the temptation to add in unnecessary details before getting blocking approval from the director."

12 Learn something new from every shot

"After you have finished your shot and the director has approved it, don't just start the next shot(s). I always try to learn something new from each experience. Maybe it's something as simple as using FK arms instead of IK. Or perhaps it's a new method for animating eyes.

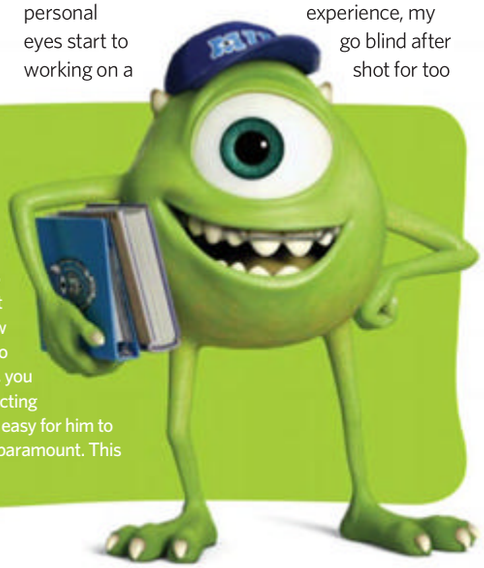
"On *Monsters University*, there were so many characters that I learned a new animation method with each character. For example, some characters had tentacles instead of legs which forced me to learn how to animate tentacles. Other characters had two heads! Whatever the situation is, try to find something new that you have learned to carry over into your next shots. An animator is like a musician learning new songs; each new song learned only helps the musician's craft and get better as an artist.

"Each animator has different individual strengths and weaknesses. I personally try to address my weaknesses head on by requesting shots that play against my strengths in order to become a more well-rounded animator."

THE ANATOMY OF...

The animation techniques behind Mike Wazowski, one of Pixar's most loved characters

"Though Mike Wazowski appears simple at first glance, he was a difficult character to animate well. First off, he has one giant eye which also serves as his body so right away you are limited with acting choices. Acting out references for your shots required you to think about how your acting choices would translate to a character with no differentiation between a body and a head. Furthermore, you had to think about how one giant eye would affect your acting choices. Also, because of his simplistic shape it was very easy for him to appear rigid so making sure he remained malleable was paramount. This was done by treating his body like a bouncy rubber ball."



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> "The Edit Stencil tool in Mudbox [warps] the stencils so that fine details will flow around the model convincingly"

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Resurrect a realistic Velociraptor

Model, texture and render an aggressive, dynamic and realistic-looking Velociraptor in Maya and Mudbox

In this tutorial we will explain the processes of modelling, texturing, posing and rendering a realistic Velociraptor. You will learn techniques for sculpting large muscle groups and skin folds, large, repeating scales and fine details such as small scales, skin pores, wrinkles and bumps. We will cover the texturing process, including how to use the Cavity map to make details pop and use the Edit Stencil tool in Mudbox to warp the stencils so that fine details will flow around the model convincingly. Posing the model is very important and can transform a plain sculpt into something lifelike and believable. Lastly, we will learn how to create materials and lighting in Maya for rendering convincing-looking skin.

JAY HOWSE
Raptor, 2015

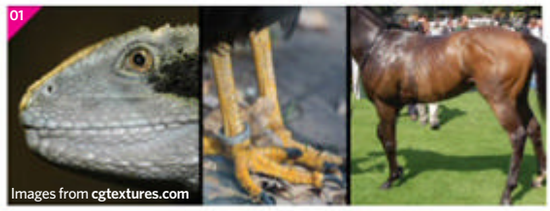
Software
Maya, Mudbox, Photoshop

Learn how to
- Sculpt muscle, skin and scales for the model
- Create textures that are detailed and realistic
- Create custom Vector Displacement Maps
- Create a dynamic pose
- Render convincing lighting and materials

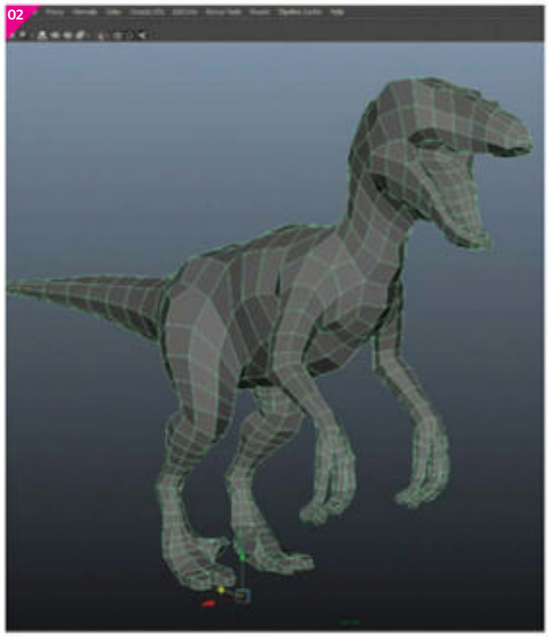
Concept
The concept was to create a realistic and aggressive -looking Raptor from the base model all the way through to a final posed render.

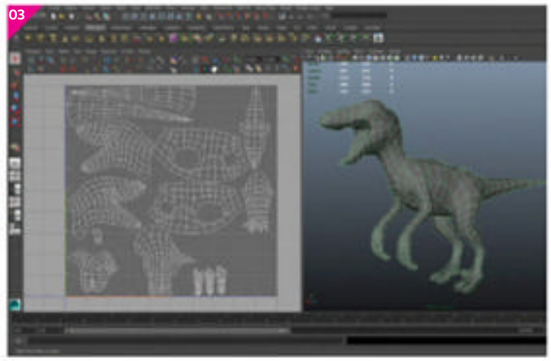
01 Collect references To create a believable creature, the first step is to gather references from real life. We can never know what dinosaurs really looked like, but by observing creatures alive today we can make something convincing. Lizards, crocodiles and snakes are a good reference for scales, skin colour and texture. But, note that dinosaurs were not like modern reptiles (which tend to lie flat with limbs splayed out to the sides), they are dynamic and have powerful hind limbs. Look at bird claws for the feet and even dogs or horses for the underlying muscle and bone structure.

02 Create the base model Set up a side view of your dinosaur as an image plane to work from, ideally from a real skeleton so you can get an idea of where the important bones lie and how they might affect the shape. Model in a symmetrical but relaxed pose with arms and legs slightly bent. This model will be a base mesh for sculpting so it can be quite simple, but do make sure it has the correct number of toes and fingers, and the mouth is modelled in an open position. Leave the teeth, claws and eyes as separate meshes.



Alternative base modelling methods
In Mudbox you need to start with a polygonal model as a base mesh, but the base model can also be created in different programs. You might like sculpting in ZBrush with DynaMesh or building up your model with ZSpheres, so choose the method which works best for you. One advantage to working with a UV mesh is you can quickly bake out textures and send the model back to Maya. The model can be rigged and posed in Maya and sent back to Mudbox as a sculpt layer.





03 Create UVs and clean up Make some UVs for your base model as it will let you quickly try out ideas for texturing and baking out test maps throughout the process. Make sure your model is symmetrical and the geometry is clean before importing to Mudbox and go to Edit>Set Topological axis. This will help if you accidentally start working with mirroring turned off – you can right-click on the layer and mirror the details across. Also, it will enable sculpting with mirroring on a posed, asymmetrical model.

04 Sculpt muscle and bone Work in layers as much as possible – this gives more flexibility and lets you try out ideas without worry. Subdivide the model to around 1 million polys, and work quickly and roughly with the Wax brush to build up the underlying muscle, bone structure and overall shape. Use the Move brush for larger adjustments to the shape and proportions, and exaggerate the muscle definition and bones under the skin. Look at the anatomy of dogs and big cats to guide you in areas like the hips and ribcage.

05 Refine the model Smooth out the rough forms and refine the shapes of the muscles with the Smooth and Wax brush to give the impression of skin stretched over muscle. Try to avoid working on fine detail or scales at this point. Use the v_fold_vdm (Vector Displacement Map) brush to create large hanging folds of skin around the neck and limbs. Import and position the claws, eyes and teeth, and sculpt the eyelids, fingertips and gums around the imported meshes (lock the imported meshes so they are not affected as you sculpt).

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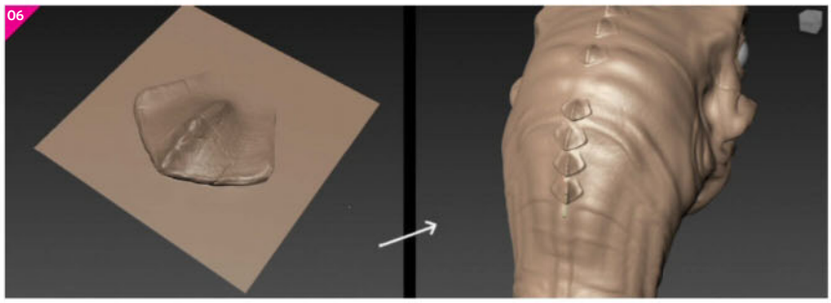
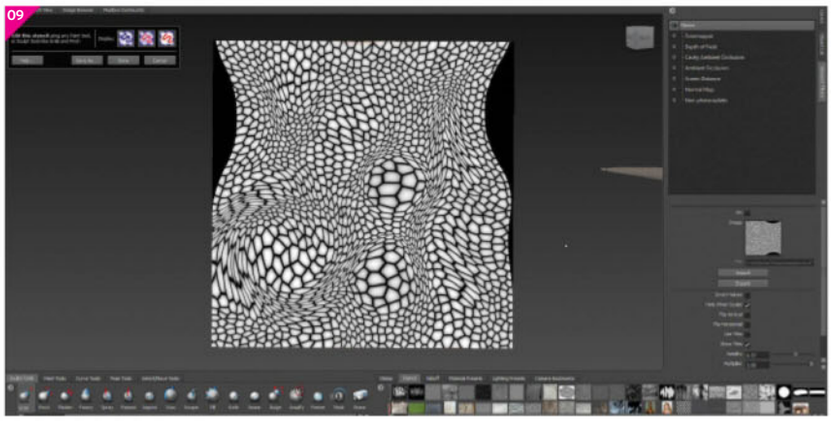


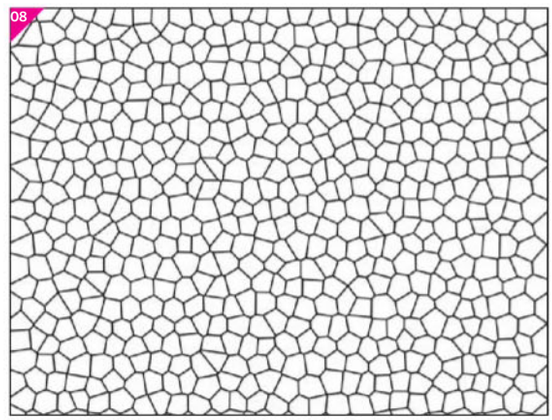


Always think about your render

During the modelling stage it can be useful from time to time to bake out a quick Normal map (even if the sculpt is unfinished) and bring the model into Maya to do some test renders. If you start to set up your render scene early on in the sculpting process it can help to identify any parts which aren't working. Sometimes details will look good in the sculpt, but it can get lost in the more subtle lighting of a render, or the render may show up areas where there is not enough texture resolution or geometry.

06 Add large scales We will create a Vector Displacement Map to make a repeating ridged scale down the creature's back. Create a plane in a new scene, subdivide and sculpt a detailed single scale. Try to create some overlapping parts to add more interest. Create another plane in the same place and use this as the target to bake a Vector Displacement Map. In your scene, import this map as a stamp and use the Repeat brush to create a line of scales down the back, making them progressively smaller as you reach the tail.

07 Sculpt leathery skin Find a hi-res view of an elephant or similar creature from a texture site such as **cgtextures.com**. Import it into Mudbox as a stencil and using the Edit Stencil tool, move and warp the image into place so it flows with the contours of your model. Use the Foamy brush on a very low strength to brush the texture onto your model. For the neck area the elephant's trunk was used as a stencil, again warping the stencil around the curve of the neck. Use the v_wrinkle_vdm brush to manually deepen some of the cracks.



08 Prepare scale textures Scales are the most time-consuming part of the sculpt, as much of the work has to be tweaked manually for a good result. For a general purpose, randomised hexagonal scale pattern, create a 4K texture in Photoshop and go to Filter>Texture>Stained glass to make a basic texture. This simple texture can be quite versatile as it will be stretched or warped later in Mudbox or Photoshop to create different shapes, but you can build your own scale patterns for different parts of the body if needed.

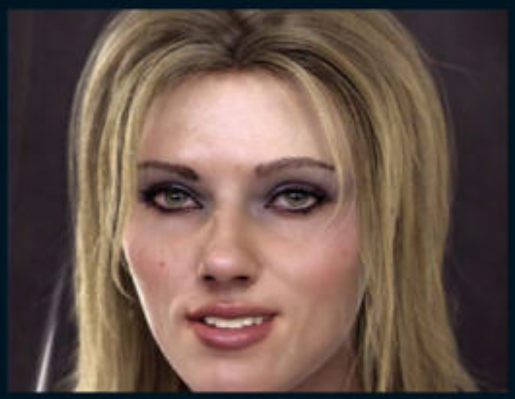
09 Sculpt scales using the stencils Edit the stencil in Mudbox to create bulging areas and transitions from large to small scales. This can also be done in Photoshop with the Liquify tool. With the Foamy brush on a low strength, add the scales to your model, making sure they follow the contours of the body. Use the v_wrinkle stamp to manually deepen some of the gaps and use Erase and Amplify to remove or enhance the occasional scale to add a bit of variation.

10 Add final details Add fine layers of noise and grime to the model to break up the smooth surfaces. Add occasional lumps and pores to the skin, cuts, missing scales, abrasions and so on. Make sure you add asymmetrical details across the central axis like scars, wrinkles and skin folds. Finally check that the fine details are not overwhelming the mid-level shapes of the model. If you've been working with layers you should be able to tweak the layer opacity (you can even push it up above 100 to increase the effect of a layer).

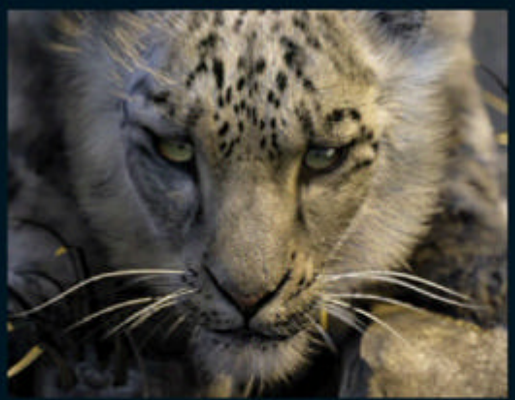
Showcase

Jay Howse

I have worked as a 3D artist in the games industry for around 14 years at Rare and Jagex. I am currently working with Indie studio MakinGames creating all the artwork for *Raging Justice* for Xbox One and PC.



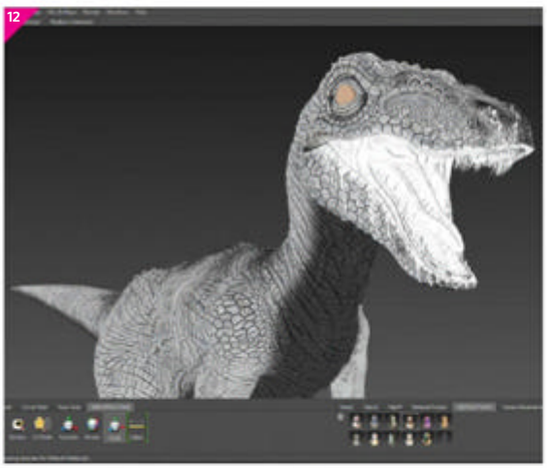
Scarlett **Maya, Mudbox, Photoshop (2014)**
A portrait of actress Scarlett Johansson to help me improve my face sculpting, skin and hair rendering skills.



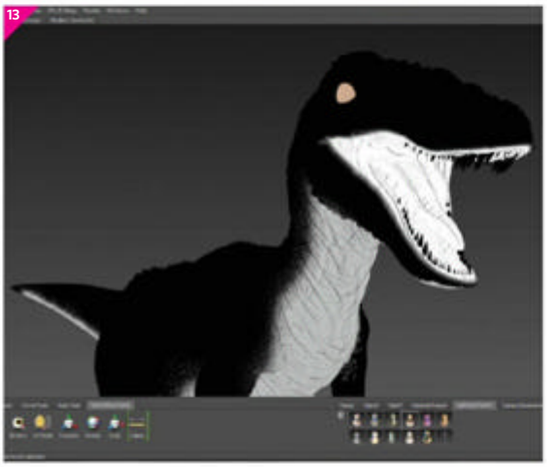
Snow Leopard **Maya, Mudbox, Photoshop (2011)**
The rare snow leopard – sculpted in Mudbox and rendered in Maya/mental ray with Maya fur. Depth of field was achieved in post with a depth map and lens blur in Photoshop.

Chimp **Maya, Mudbox, Photoshop (2010)**
A render of a young chimpanzee, I wanted to create the feel of a piece of wildlife photography.

11 Creating Diffuse maps Once the sculpt is finished bake out a Normal, Cavity and Ambient Occlusion map. Use Mudbox to block in key areas of the model on different layers – tongue, gums, mouth, claws, underbelly, eyes, dirt/dust and so on, and export the layers to Photoshop to add more detail. The Cavity map can be used to create dried dust and mud in the deepest cracks – invert the map and adjust the contrast and brightness until only the deep cracks are visible as white lines. Now make this layer additive and adjust the colour to yellow or brown.



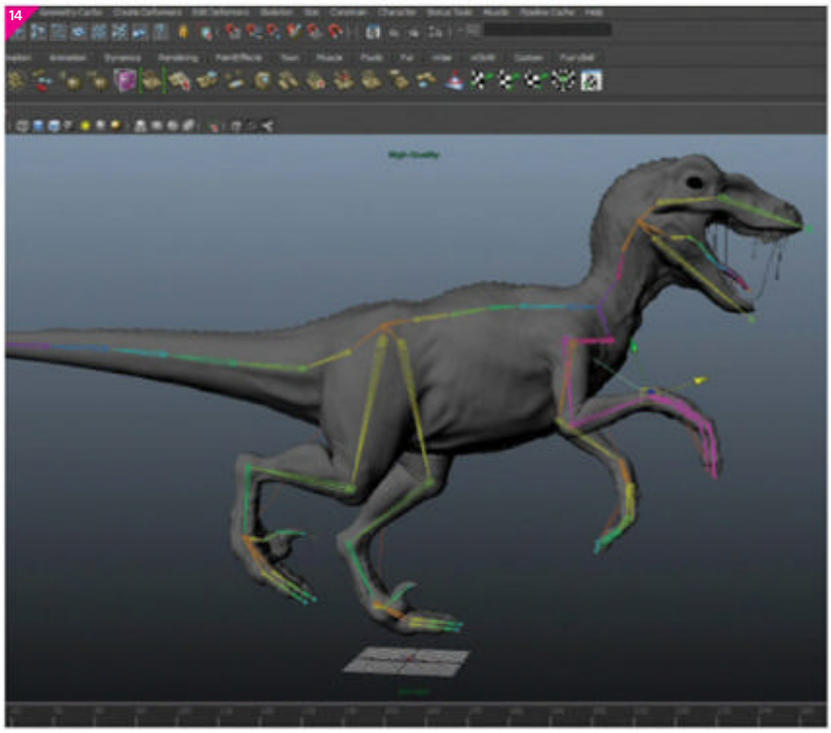
12 Create Gloss maps This map will probably be the one you spend the most time tweaking at render stage, as the ideal values can depend on the lighting in your scene. Start with the Diffuse map and go through each layer deciding how glossy it should be. For this tutorial we wanted the inner mouth very glossy and wet-looking, with drool and specks of blood around the nose and mouth, so these areas were all set to almost white.



13 Subsurface scattering map The mouth area should be really wet, gooey and nasty-looking, so it needs some subsurface scattering and in particular backscattering, but we don't really want any scattering on the hard scales or leathery areas. Use the masks you painted for the mouth, gums and also the underbelly area. The mouth area should be set to white and the belly area maybe a midgrey to let a bit of scattering through.

Displacement and Normal maps

For this tutorial both a Displacement map and Normal map was used. Both maps were baked from subdivision level 3 of the model, which was used in the render. In theory you wouldn't need a Normal map if your displacement has enough subdivisions, but in practice it just seems to help the details pop more. Experiment with this in your own project.

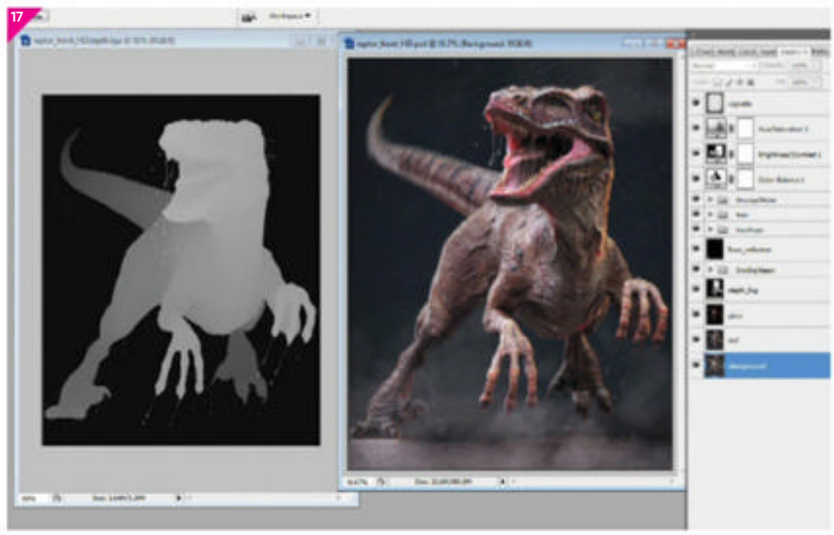


14 **Pose the model** Export a mid-resolution version of the model from Mudbox into Maya (around 100K-200K) and set up a simple skeleton. It doesn't have to be a fully working rig but if you add IK to the legs and arms, posing will be easier. Skin using a Heat map bind method for best results, and you shouldn't need to do much manual skinning work unless you need really extreme deformations. If required, this model can then be sent back to Mudbox as a sculpt layer to add additional details, flesh folds and so on.

15 **Lighting and scene setup** We will use mia_material_x materials and HDRI lighting with a linear workflow for realistic results. The easiest way to set this up is to tick 'enable colour management' in Render Settings, then add an mia_exposure_simple node to your camera with gamma 2.2. The important thing to remember is to then set any normal maps to Linear sRGB. Choose a suitable HDR map and add extra directional or area lights if required.

Add subsurface to mia_material_x

To add subsurface scattering to an mia material, create a misss_fast_skin_maya material and set the ambient, diffuse colour and overall spec to 0, then middle-button drag the shader into the Additional Color slot of the mia_material. Finally, in the Shading Group of the mia_material add the lightmap node created by the sss material (under Lightmap Shader, drag in the lightmap node from the Hypershade – it should be called something like misss_fast_lmap_maya). Now the scattering effects from the skin shader should be added to the mia shader.



16 **Extra tiny details** Create strands of drool and water droplets around the mouth and apply a mia_material_x with the Water preset. Create lots of little spheres in the mouth and on the tongue to simulate bubbles of drool. Apply another mia_material, but this time use the glass_thin preset and change the IOR to 0.33. Bristles were modelled in Maya and added to the neck and back to add a bit more interest and break up the silhouette.

17 **Final touch ups and compositiing** Render out a depth map and use Lens Blur in Photoshop to add some depth of field to the image. The depth map can also be used to create some subtle distance fog. Add layers of smoke, rain and dirt in Photoshop to give the image a bit more life and utilise Color Balance and Curves to tweak the image to your liking for the final image.

Texture distinct steampunk characters

Master the creation of two technically different characters: a steampunk machine-maker and his giant, steam-powered mechanical marvel

ALDO VICENTE
Machinist and the Steam Powered Guardian, 2015

Software
Maya, ZBrush, Photoshop, RoadKill, XNormal

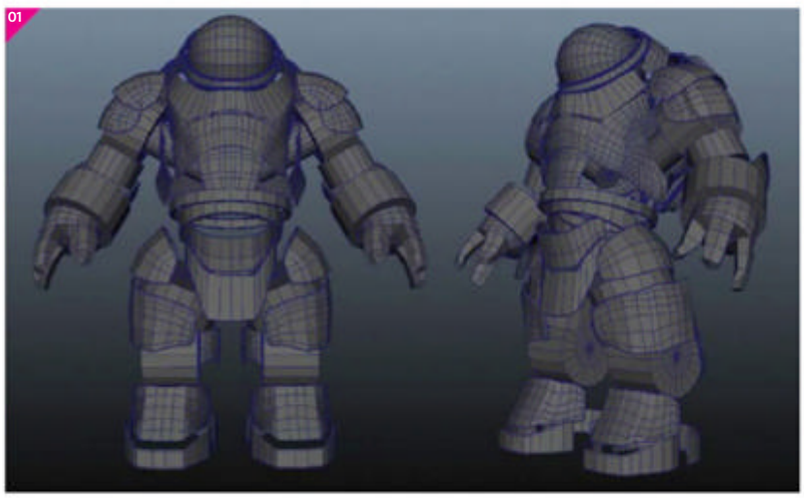
Learn how to
- Use 3D character workflows
- Model characters
- Texture and lay out UVs
- Utilise mental ray materials

Concept
I wanted to create a Victorian era machinist and his creation; a giant steam engine, built for military defence. The designs are steampunk-inspired, with a heavy industrial emphasis.

YOUR FREE DOWNLOADS from **filesilo.co.uk/3dartist**
- Tutorial screenshots
- Video tutorial

In this tutorial we'll be taking an overarching look at some 3D character workflows. We will go through the process of constructing characters, from basic modelling and sculpting to building textures and materials, posing and rendering. We'll be creating a steampunk scene with two characters that are very different from a technical standpoint. Each character will present us with a distinct set of challenges, which enables us to explore a variety of tools, techniques and workflows. While building our machinist, we'll get to practice an organic character workflow. We'll go over techniques for modelling and sculpting anatomy, clothing and accessories, as well as tools for quickly unwrapping clothes and baking perfect detail maps. Our guardian character will have us work through balancing the character's motion functionality and aesthetic appeal. We will also explore techniques for quickly texturing metals and building convincing materials. Finally we'll build a quick environment and set up our scene for rendering.

01 Guardian block-in
Let's start with a quick, rough pass. This block-in gives us an early look at our character's overall shapes and it's important since our character's proportion, overall feel and personality will get lost between the concept art and the 3D model. By blocking in the full character as quickly as possible, with minimal regard for edge flow, neatness and so on, we avoid wasting time on work that will most likely need to be redone. We can worry about edging and cleaning once our block-in feels like our concept.



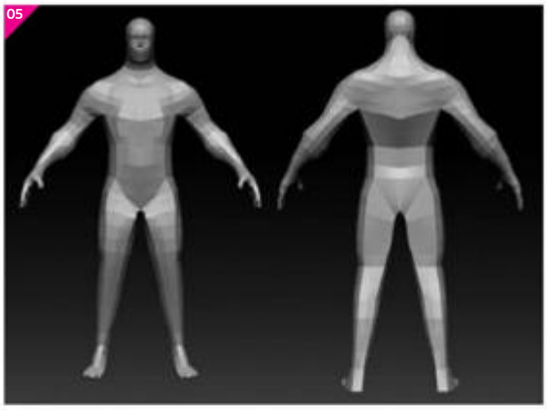
02 Build our parts library
Now we can start looking at our overall forms and figuring out our individual parts based on the character's intended functions. The best part about working on mechanical characters is that, just like in real-life machines, a lot of parts can be reused. We only need to model out a few types of protective plates and one of each part so that the arm can rotate, twist, bend and so on. This means that we are saving a lot of time in modelling and UV layout while creating a cohesive and believable design.

03 Lock down the look
With our small library of parts and our block-in as a reference, we can start finalising our model. We can duplicate, shift and modify existing parts to fill in the rest of our character. We have to keep function in mind to a certain extent (knees have to bend like knees, for example), but there's no need to overthink all of the internal workings of our machine. Form and silhouette should take some priority. Hard surface parts can create very rigid-looking forms, so it's important to emphasise the S-curves in our design to give our character a lively and natural feel.

“Hard surface parts can create very rigid-looking forms, so it’s important to emphasise the S-curves in our design”

04 Clean our mesh Neat, well-distributed edges are helpful for UV layout and surfacing. The Sculpt Geometry tool on Relax mode, or the Relax Vertex tool are very useful here. Let's delete the back faces on our guardian's outer plates. This will reduce poly count, save UV space and make unwrapping much easier. Double extrude border edges has tons of benefits; we get a consistent edge loop around our mesh, we create support edges for smoothing and UV-relaxing algorithms, and we're adding subdivision density around our borders to provide more fringe detail when sculpting.

05 Build the anatomy In this step we want to create our machinist's anatomy with concept-accurate proportions and clean edge flow. Generally we want to keep this mesh relatively low poly, as we will be using it to extrude our clothing and accessories later on. We can start with an available generic anatomy model, or we can build a simple base mesh in Maya and take it into ZBrush. Here we'll manipulate the physique to fit our character. Our machinist is a cross between a blacksmith and an engineer, so we need his silhouette to convey that he frequently works with heavy metals and equipment.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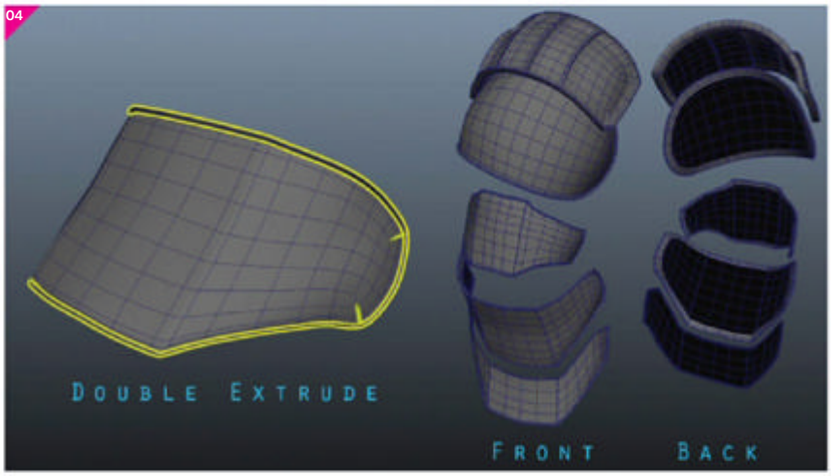
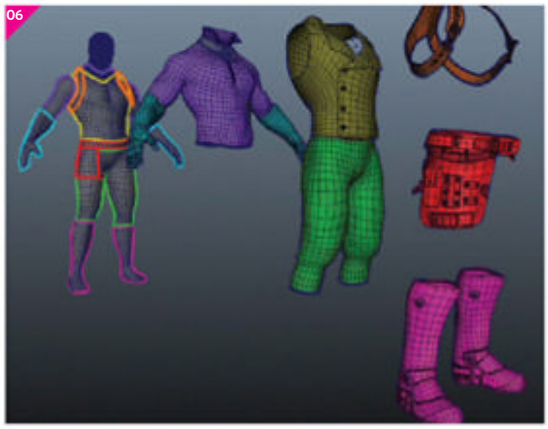


06 Model clothing and accessories Let's bring our machinist mesh back into Maya, and make sure our character is at real-world scale. Split up our model into the basic areas of our head, shirt, gloves, pants and boots. We can repeat the process to create geometry for the vest, belt and harness. Instantly we have fitting base geometry for our character's costume. We only need to refine our clothes meshes to a certain point, as most of the clothing detail will be done in ZBrush. We can use basic box modelling to shape the belt straps and harness.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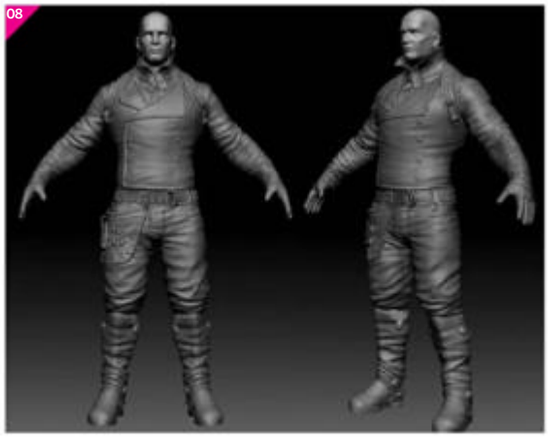
Sculpting warm-up exercise

Sculpting clothes wrinkles can take a lot of practice and iteration. It's about getting in the right mind-set rather than any particular brush or technique. I recommend starting with an exercise to help get a feel for cloth folding. Create a simple sphere on a ground plane, with a plane right above it. Imagine the above plane is a tablecloth, and try sculpting how it would land if you were to drop it onto the sphere on the ground. Try this same exercise with more complex shapes, and imagining different types of fabrics. This helps us warm up and get a really solid grasp of how clothing and folds work.

07 Prepare our costume for sculpting First, we should be sure again that we have neat, even edge distribution. The majority of this should have already been in place from our machinist anatomy model, but we can use the Quad Draw tool in the Modeling Toolkit to quickly and easily make improvements to edge flow wherever necessary. Again we should double extrude our border edges, for the reasons listed in Step 4. We could do UV layouts at this point, but it may be preferable to do it after sculpting as some of the geo may change considerably, and our UVs may need to be redone.

08 Sculpt the clothes Here we'll be sculpting in the large and mid-level detail of our clothing. This includes the overall structure, drape of our clothes and the wrinkles. We won't be sculpting in the fine detail such as the threading and stitching of the fabric, as we'll be adding those details via our textures later. It's good to have reference of the types of fabric each piece is made of. Keep in mind that these are just panels of fabric falling over simple anatomical shapes. Also consider that these folds need to stay generic enough to work in most poses.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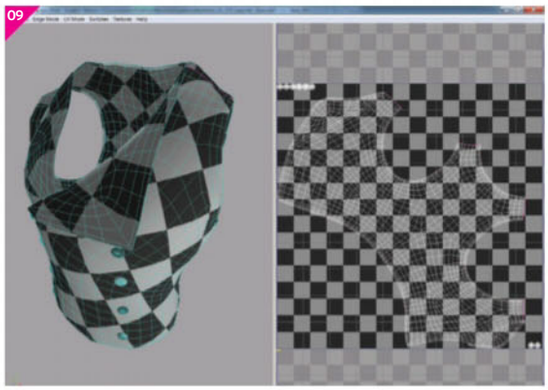


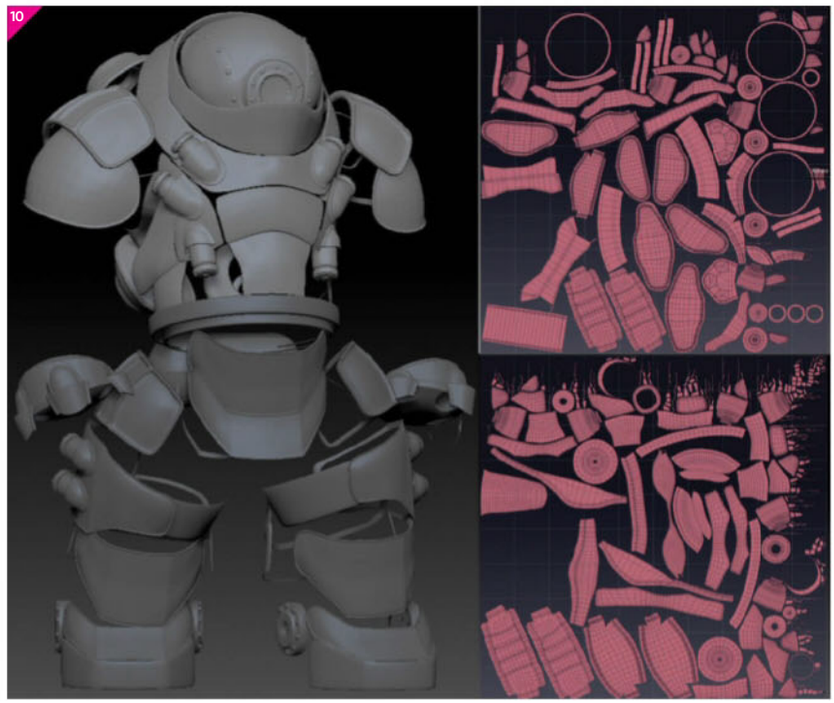
09 Lay out the UVs To unwrap our clothes, we'll use RoadKill, a free plugin for Maya. We can select our vest mesh, and run the plugin. In RoadKill we double-click to select the shoulder seam edges and hit C to cut the UVs. Instantly, we will see our vest flattened neatly in our UV viewer. We can quickly repeat this to separate the lapels and we're done. If we want to smooth our UVs out further, headus is another free option with an excellent UV-relaxing algorithm and a very simple, but fantastic GUI for flagging, bunching and stretching in your UVs.

Image-based lighting

Metal materials are mostly reflective, so in order to get realistic-looking metals, we need to provide them with an environment to reflect. For this, we'll use image-based lighting. In the Render Settings, go to the Indirect Lighting tab, and click 'Create Image based Lighting' to put an IBL sphere in the scene. We can load an HDR image into our IBL sphere node – free HDR images are available online. Now all we need to do is turn on Final Gather. At render, mental ray will use data from our HDR image to light the scene and create some convincing environment reflections for us.

11 Paint metal grunge It's hard to distinguish which UV islands correspond to what plates by simply looking at the flattened mesh. This makes it difficult to paint our textures in 2D. Instead, let's turn on ZBrush Polypaint and subdivide our mesh into the millions. We can start this off by coating our mesh in 50 per cent grey. Let's set our brush to RGB Color Spray with a grungy alpha and zero z-intensity. We'll paint in the edge grunge, rusting and scratches. At this point we are only concerned with colouring this detail onto our mesh. Grunge and rust should be darker values while scratches should be a white colour.

12 Create the metal textures Now we should export our Polypaint data as a texture map and bring it into Photoshop as an overlay layer with our base metal colour underneath. The grey in our grunge map will disappear, leaving us some dark grunge and light scratches that will go over our base colour. We'll also add a subtle metal photo texture over our base colour and colourise our grunge to get a rusty red hue. This is our Diffuse map. We'll fashion a Bump map with desaturation and then invert our scratches to black. We'll raise our base colour to near white and then adjust the noise layer to a medium grey.

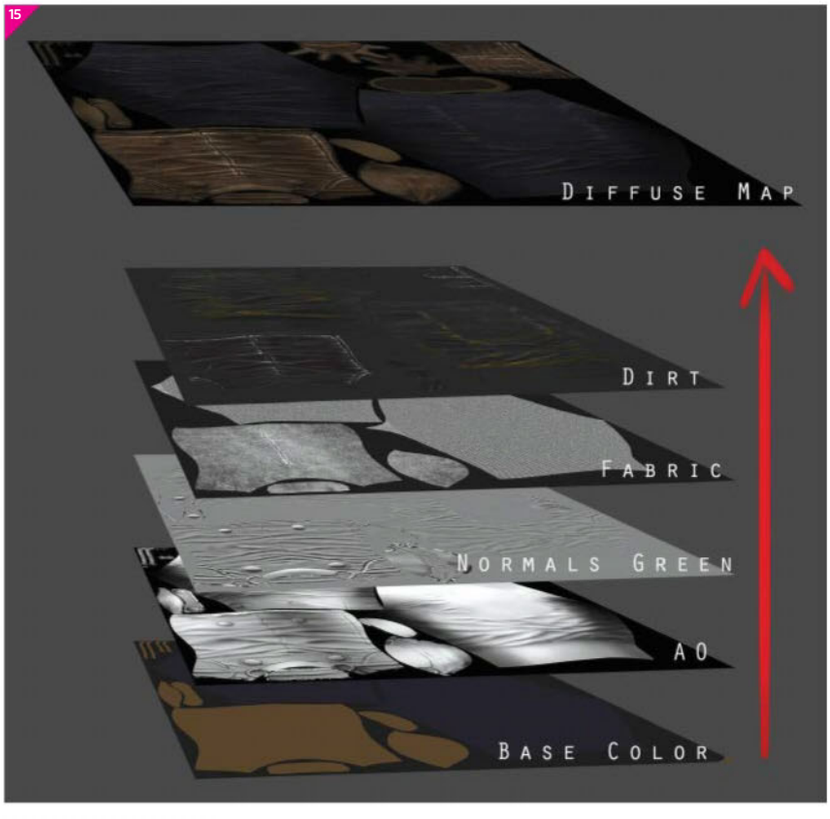


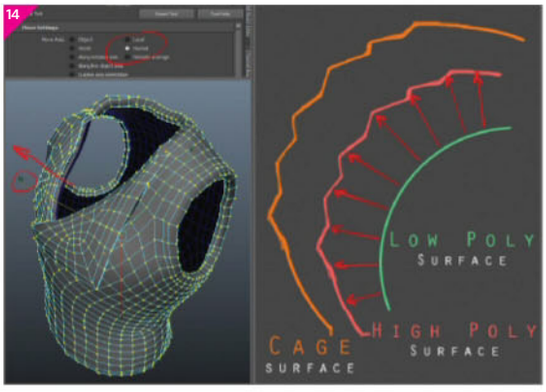
10 Unwrap the guardian Our guardian has a lot of internal and external parts, but we can save a lot of time and UV space by using 3D procedural textures on the smaller, less visible internal parts. We'll only unwrap the outer metal plating of our guardian. Let's select our plated parts, export them to ZBrush and run the UV Master plugin. Because of the cleanup and double extrudes back in Step 4, our plates are essentially curved planes with structured border edges. This makes them ideal for the UV Master algorithm. Almost instantly, we get a clean, evenly scaled UV layout for all our plates.

13 Create metal materials Metal materials are reflection-based so we'll use image-based lighting to give our metals something to reflect. Using mia_material_x_passes, we'll plug in our Diffuse and Bump maps. Metals have low diffuse weights. Our metal is relatively rough – it has a smooth, metallic microsurface, but its overall surface is too rough to cleanly reflect any image. We will get a certain level of gloss but our specular reflectivity should stay low. To control this further, we can fashion a Specular map from our Bump map by adjusting the levels to fit within our desired reflection values.

Understanding map baking in XNormal

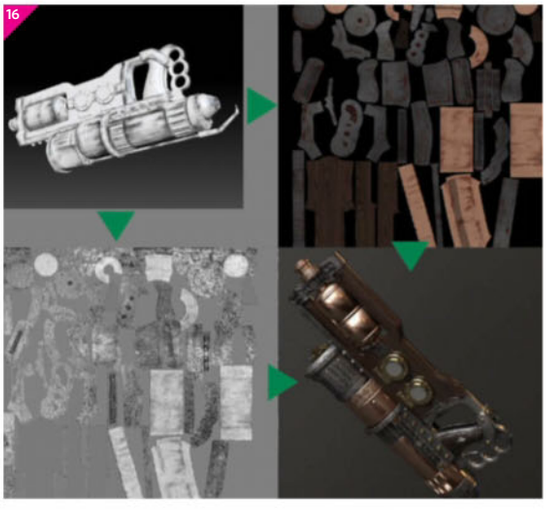
XNormal casts rays from the lower-res mesh surface to the hi-res surface. The rays' travel distance and normal data is written as colour data to the UVs of the lower-res mesh to create our maps. However, there is a travel distance threshold – if the rays travel past that distance without reaching the hi-res surface, they get ignored and no data is written to the map. This is why we use cages around our meshes instead of distance thresholds. The cage surface becomes the new distance threshold, ensuring we collect all the hi-res data, with optimised calculation time.





14 Bake good maps We'll bake our maps using XNormal. With our vest as an example, we'll export the high and lower-res meshes. To create a cage mesh in Maya, we'll duplicate the lower-res mesh, and with Translate set to Normal we'll move all the verts out along N. The cage mesh should be just big enough to fully envelope both high and low-res meshes. Now we'll take our meshes into XNormal. Right-click on the low-res mesh and click 'Browse external cage file' to assign our cage mesh. Set to Average Normals and Bake! This will produce full, clean, accurate and fast maps!

15 Texture the machinist Normal and AO maps are a great starting point for Diffuse, Bump and Specular textures. In Photoshop, paint base colours for each island in our UV map. Multiply the AO map over the base and Overlay the green channel of our Normal map to create top-down shading. Now we'll tile and overlay images of fine fabric detail. We can use those same overlays later on top of a grey background to create our fabric bump texture. Let's paint in some subtle layers of dirt, dust and grunge to finish our diffuse texture.



16 Texture the equipment For our equipment, textures, we'll use a technique similar to Step 11. With the help of ZBrush Polypaint, we'll colour in the rusting and scratching around our equipment's nooks and edges. We can bring these maps into Photoshop and colourise or do a photo texture to create a grunge effect. Again we'll repurpose the same maps to create our bumps, indenting scratches, dinks, rust and noise. We can add neat decorative pieces by adding black-and-white patterns into a Bump map, and overlay these patterns into our Diffuse map to make them pop even more.

> With the help of ZBrush Polypaint, we'll colour in the rusting and scratching around our equipment's nooks and edges

WorldM

17 Clothes shaders Let's import our machinist textures and plug them into a new mia_material_x_pass. Remember that the Normal map gives us the fold and wrinkle detail, while our fabric bump maps gives us the fine stitching and cloth detail. Both will be plugged into the shader. The cloth for our vest, pants and shirt is generally pretty diffuse, with very low gloss and specular reflectivity. We should also adjust the BRDF as looking at cloth at direct angles is especially dull. We can add a tiny bit of translucency, or we can fake it by plugging in a very weak mia_self_illumination node.

18 Build the remaining materials We'll need to build several different material types for our equipment. With our maps ready, gather reference and create some fresh MIA materials. First, name all our materials, turn on Use Fresnel, and input the real-world Fresnel values for each one. Now we can start balancing the Specularity and Diffuse, knowing that our reflective distribution is accurate. Since there's no refraction, we can observe our reference and estimate the reflective strength, and the shade strength from zero to one. With MIA's energy conservation math in mind, we can solve for really accurate reflective and diffuse weight values.

MIA energy conservation math

The MIA materials are physically accurate, meaning that Diffuse plus Reflection plus Refraction will never be more than one – the total incoming light. But how do our input values get balance out? When we increase the value of one of these, its resulting effect takes energy from the result of the others to maintain the same total energy output. It breaks down as follows:
Diffuse result = (Diffuse weight value) – (1/2 Reflectivity attribute value) – (1/1 Transparency value);
Reflectivity result = (Reflectivity attribute value) – (1/2 Diffuse effect) – (1/2 Transparency attribute); and
Refraction result = (Transparency attribute value) – (1/2 Reflectivity attribute value).

19 Make a background environment Let's create a simple ground or wall backdrop. We'll give the wall extra edges to indicate where the brick meets the concrete segment. We can use planar mapping to quickly get UVs. In Photoshop, we'll use photo textures of bricks and concrete to create a quick Diffuse map. We'll balance the levels and colours to make the different images fit each other. Now we can fashion a Bump map by desaturating and pushing recesses into black, while pulling convex surface space up to white. To add depth to our environment in Maya, we can apply a bend deformer and create a rounded wall.

20 Render our scene Let's set up render passes for better control over our final image. In Render Settings>Passes, we'll create and associate beauty, AO, diffuse, Indirect, reflection, refraction, shadow and specular passes to all three. We can render and save these passes out individually for compositing in Photoshop. We should use 'Linear Dodge (Add)' blending mode to put our passes together and re-create our beauty pass. Finally, let's create a custom matte pass, assigning different coloured surface shaders to each character and the environment. Now we have full control for tweaking each asset and element to make our final image.

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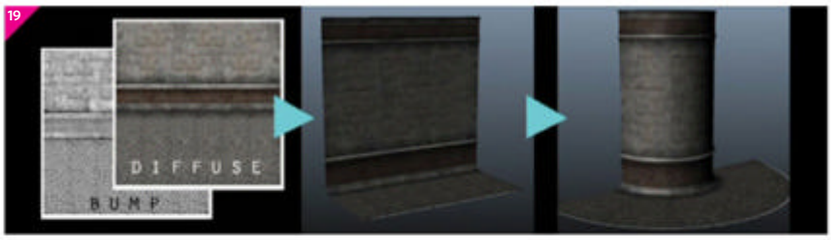

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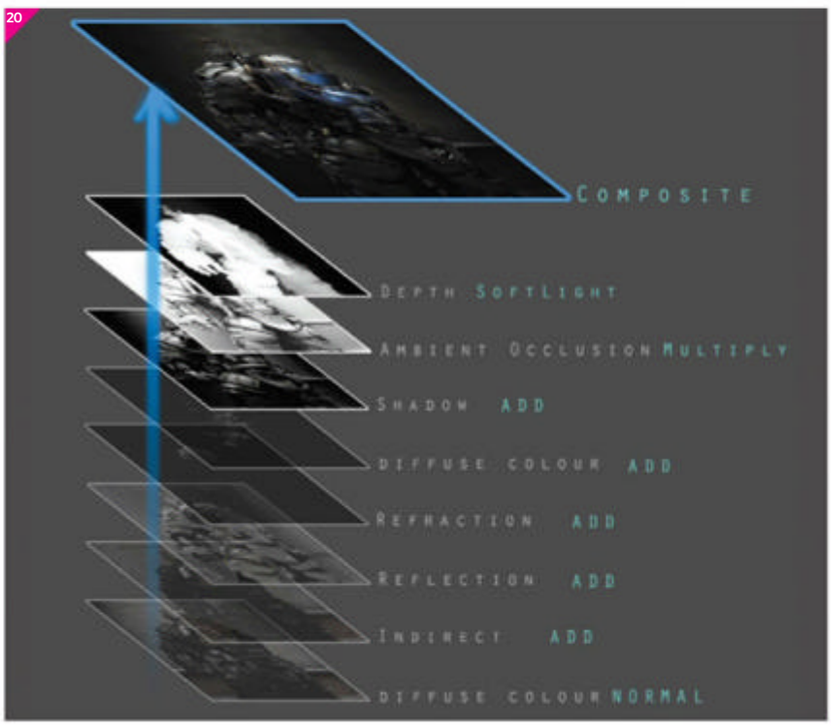

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CHRISTIAN RESKI
Venice, 2015

Software
Maya, MARI, V-Ray

Learn how to
- Get your head around the advantages of asset and V-Ray material libraries
- Utilise triplanar projection for basic displacement and texture layout
- Create UDIM sequences in MARI for masking materials
- Set up materials using both projections and UV based layer masks
- Save time by knowing when and where to put detail onto your model's materials

Concept
The main goal for this project is to create a fast and efficient surfacing workflow for an architectural asset, always taking into account artistic freedom as well as reusability and simplicity.

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Modular background buildings in Maya (Part 2)

In the final part of our tutorial, learn how to use projection and UV-based techniques to create asset materials

Setting up complex background environments for a project on a tight schedule always is a challenging task, especially when working in a small team. Also, chances are that changes and iterations will have to be made until the very last moment of production. So in cases like these, being able to build materials for lots of different building assets in a short amount of time, while keeping everything as nondestructive and versatile as possible, is imperative.

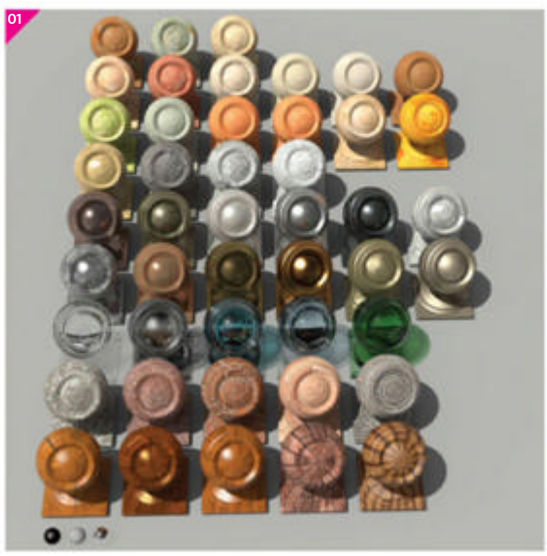
In issue 80, Georg-Sebastian Dressler showed us how to create a building using a modular approach. In this follow-up tutorial we'll pretty much use the same philosophy with surfacing our asset. This means we'll not simply paint our textures from scratch for each asset individually, but rather go ahead and build ourselves a tileable texture library first, as well as a library of predefined materials and objects that we'll then use on our building, such as wood, brick, lamp posts and so on. The idea is to get approval for the basic look and feel (using shader ball line-ups for example) before we throw everything we need onto the model. Doing it this way saves us from having to go back and forth between painting textures, applying them and most importantly: doing it for each of our buildings in the scene!

So once we're finished with setting up the libraries (a process we have not talked about in detail since this tutorial is more about using the stuff you already have prepared rather than creating it), we'll go ahead and check our asset for errors such as overlapping UVs or missing geometry. Once we're done we'll use triplanar projections for basic displacement as well as Diffuse Color materials which we'll then blend together using UDIM masking in MARI, always keeping an eye on the right scale of our tileable textures. We'll also try to keep the balance between time and quality, making sure not to use too much detail in areas where it's not needed. We'll make some final adjustments to our materials before assigning our library mats to minor parts of the model, such as chimneys, doors and windows.

01 Prepare your libraries We won't go into much detail on how to create libraries as they depend heavily on the pipeline you're working in. However, here are some general tips for setting up libraries for this project. First make sure every texture is tileable. Resolution is also crucial for a quick projection workflow, so we strongly recommend you set up your textures in 4K or higher. Scale is important too and scaling down is always better than having to do a blow up. Keep every tileable texture category (like brick, plaster a.s.o.) the same scale. This makes it a lot easier for working on other assets on the same scene, because you already know the right scale values. Also do a line-up of your materials to check if the colour, saturation and reflection values are matching the overall look. Finally, when working on the light rig, always use the same neutral light setup. This makes matching materials a lot easier.

02 Check your assets Time to begin. Open a fresh scene in Maya and import both the asset and the light rig (alternatively you can use the scene provided). Select the geometry and open the UV Editor. Zoom in and check if there are any overlapping UVs. If you find any, move them to a free space on top of the UDIM list. Also make sure there is no hidden geo left in the scene. We'll export the object to MARI in just a moment, and we don't want to mess up our UV layout with geo that we don't need.

> When working on the light rig, always use the same neutral light setup. This makes matching materials a lot easier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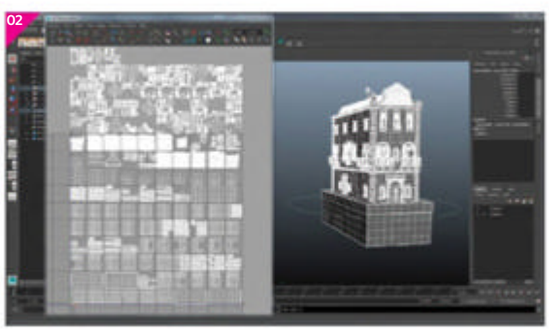
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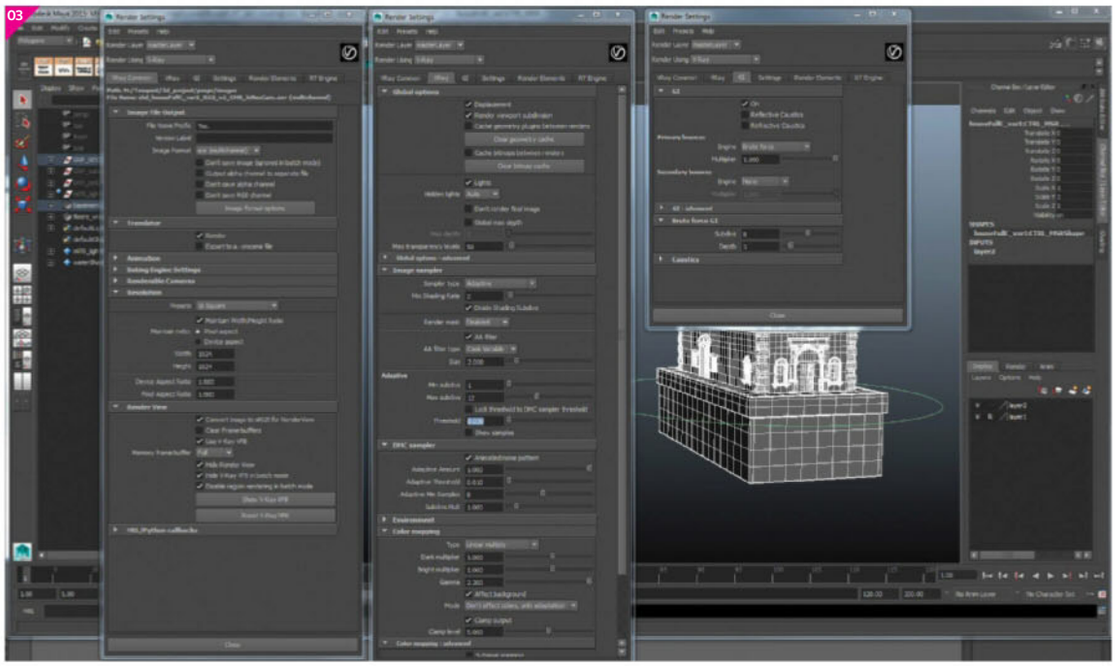
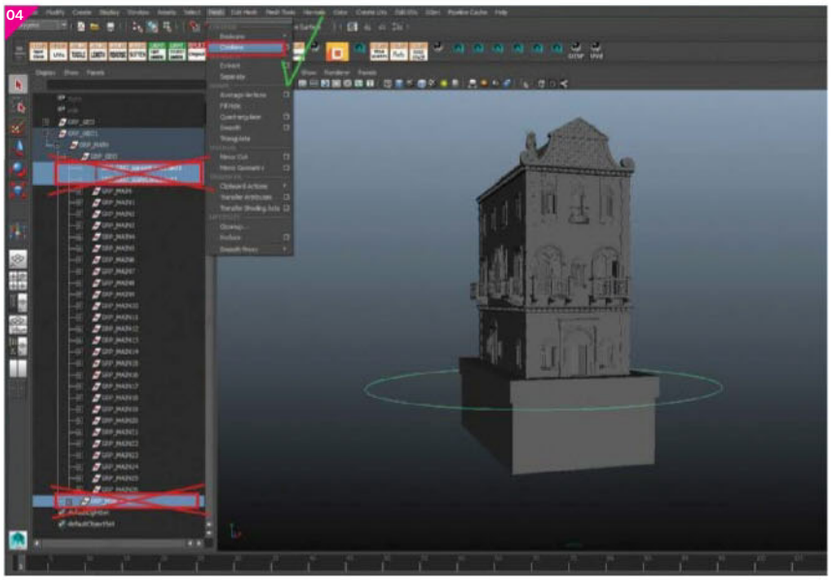
03 Basic scene setup

Once everything has been imported into the scene, open the render globals and choose V-Ray as your renderer. Start with a resolution of 1K square or less for your physical cam. Later, we'll up the resolution for better detail evaluation. Under V-Ray>Global options check the Displacement box. Use 1/12 for your image sampler, Threshold is 0.03. Use linear colour mapping with a Gamma of 2.2. Note that the light rig does overwrite both reflection and GI. Turn on GI with brute force for primary bounce, and turn secondary to none. Assign a standard V-Ray material to the building.



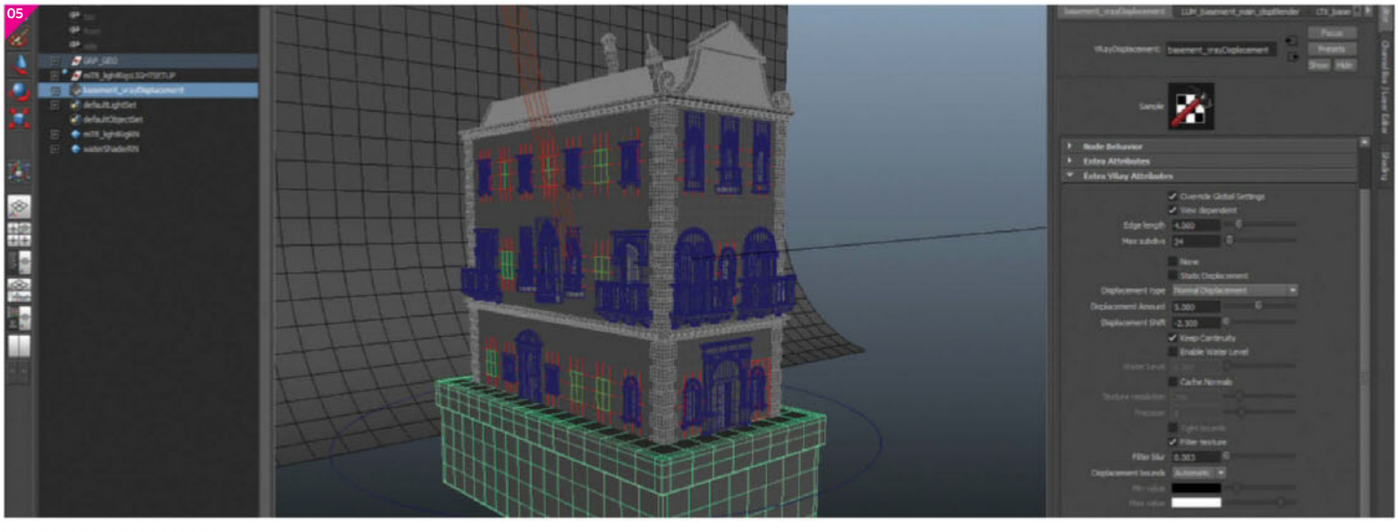


04 Combine and export

Select the GRP_GEO in the outliner and duplicate it. Hide the original. Remove the GRP_MSR_RIG as well as the constraints from GRP_GEO. Select all the duplicated geometry in the viewport and do a Mesh>Combine. Select the combined geo and delete its history. Now export the combined mesh as an OBJ. Once you're done, delete the combined mesh as well as any leftovers from the duplicate, and unhide the original. Now let's take care of our building's displacement.

05 Basement displacement property

Select the basement geometry by going to Create>V-Ray>V-Ray Displacement>Apply Single V-Ray Displacement. Select the node, and in the Attribute Editor go to Attributes>V-Ray and choose Subdivision and Displacement Control and 'Subdivision and Displacement Quality'. Since we'll be using 8-bit maps we'll need to play around with the displacement settings. Turn on Subdivide UV, set Displacement Amount to 4 and Displacement Shift to -2. Switch on Keep Continuity, set Edge Length to 3 and Max subdivs to 24.

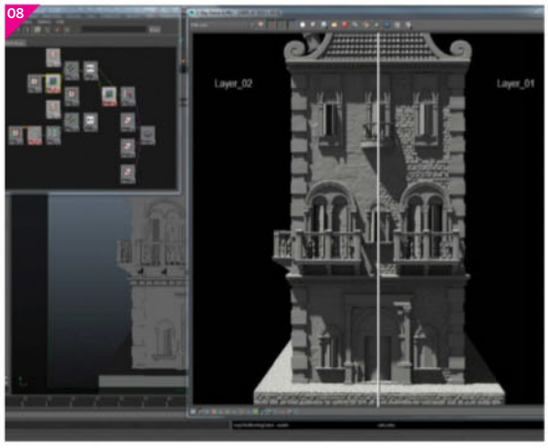


06 Triplanar displacement shader network

Open Hypershade and look for the file node. Right-click it and choose 'Create as projection'. Change Proj Type to TriPlanar. Turn off Filter Type and assign it to basement_layer01_brick_disp_1k.png. Change the scale value of the 3D placement node to 100 in XYZ. Create a MultiplyDivide node and then connect the projection.out Color to input 1 (in case you want to change the layer's intensity later). Create a LayeredTexture node and connect MultiplyDivide.outColor to input[1]. Now plug the LayeredTexture.outColor into the value slot of a luminance node and middle-drag the luminance node onto the Displacement mat of the V-Ray Displacement property.

07 Create a projection tree for the pavement

Now, do a test render. Adjust the scale value and displacement values if necessary. Once you're happy with the result create another projection tree and put it on top of the brick layer in the LayeredTexture node. Assign basement_layer02_grey_disp_64.png to the file node. This is just a neutral grey template for the pavement. You can use any other texture if you like. Now go ahead and create a standard file node. Plug it into the top layer's Alpha slot. This file node is going to contain the mask that we're going to paint in MARI in just a moment.

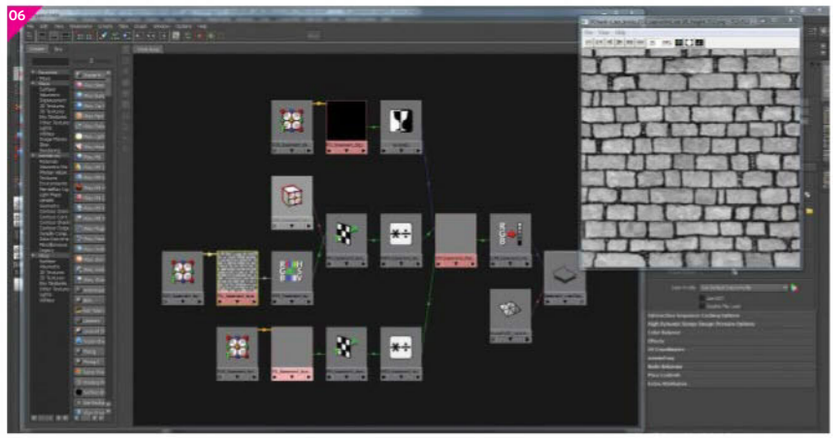


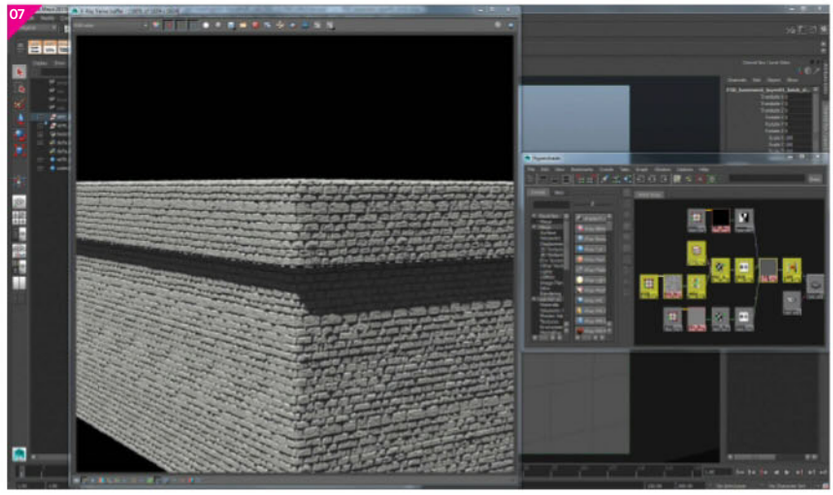
08 Floor and wall displacement

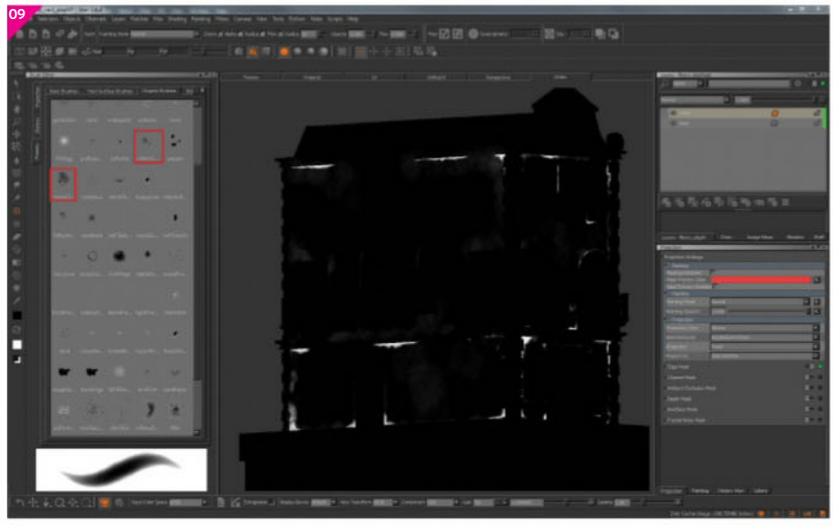
Select all three GRP_walls and create another V-Ray Displacement property. From here on out it's basically the same workflow as the basement (you can duplicate the basement's network if you want to). Now plug floors_layer01_brick_disp_1k in the first layer of the displacement network and floors_layer02_plaster_disp_2k.png in the second layer. You can use a scale of 110 in XYZ for the brick and a scale of 400 in XYZ for the plaster. Also, set the value of the plaster's translate X to -100 and translate Y to 200. This will shift the plaster a little so that it doesn't end up looking too repetitive.

09 Create a MARI displacement mask

Open MARI and start creating by clicking on File>New Project. Under Path select the combined geo that we had exported earlier. Now create a new RGB, 8-bit channel in 2K, and click OK. Select all of the UDIMs and go to Patches>Fill>Black. Create a new layer. Hide the basement geo and start painting some wear and tear into the corners using a white brush colour and low intensity. You can use edge masking to avoid any projection tearing.



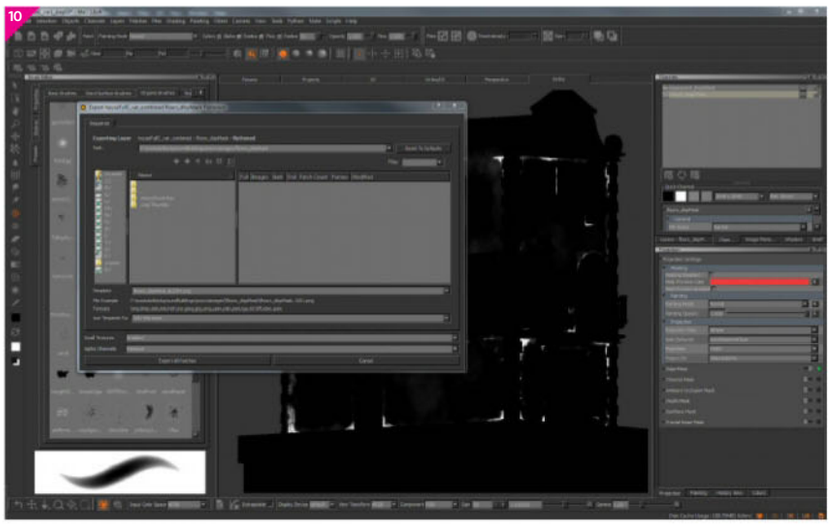


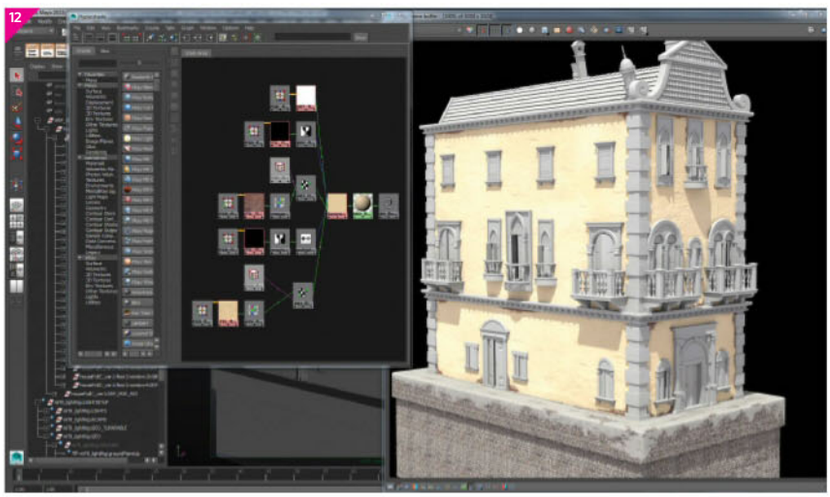


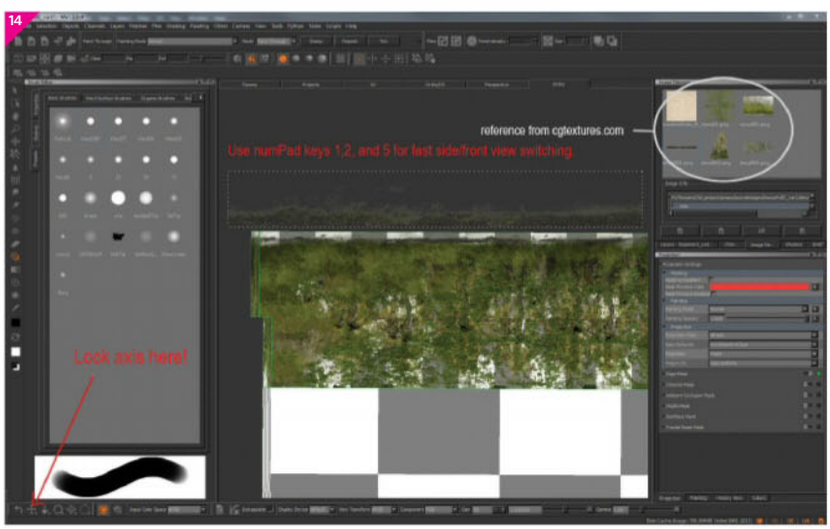
Make a reasonable compromise

When time is of the essence, knowing what will be visible in the final shot is key to saving time and efficiency. Once you know the look of the project and where the camera is going to be, you will have to decide how much detail is going to be needed, where to put it, and how render time can be saved by scaling down shader complexity. For this project, reflection is only used for certain materials, same goes for normals and bump. Also, knowing the assets are background elements with a moving camera makes it easier to go without too much stone shader detail.

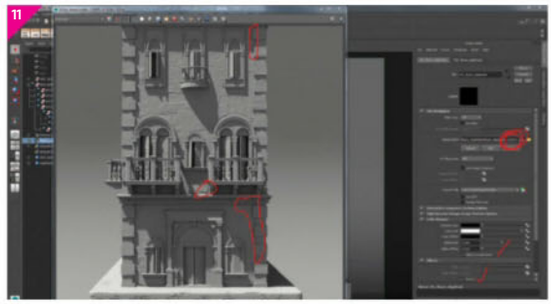
10 Export the MARI mask sequence Once you're done painting the mask, right-click on the channel and choose Export Flattened>Export Current Channel Flattened. Choose a template name and file type like PNG. Enable Small Textures and remove Alpha Channels. Make sure the $UDIM string is contained in the name of the patch sequence, then click Export All Patches. Now duplicate the channel, delete the brush layer, create a new one and then repeat the same process for masking the basement section of the model, using white colour for the pavement areas. Make sure to name everything accordingly.



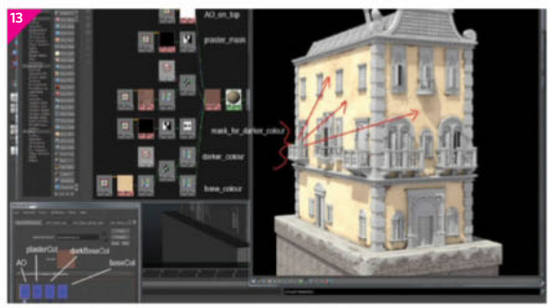




11 Finalise our building's displacement Back in Maya, select the floor displacement's empty file node we created earlier, browse to the path you exported the UDIM sequence to, and assign the displacement mask sequence by choosing the first image. Once it's assigned replace the frame number 1001 with the template string <UDIM>. This will tell V-Ray to automatically look for a UDIM sequence. Under Color Balance turn on Alpha Is Luminance as well as Invert under the Effects tab. Do the same for the basement displacement property mask. Now tweak the painted mask in MARI.



12 Get colourful The workflow for the main materials is pretty similar to displacement. Create a triplanar network with two layers, but drop the luminance node as we don't need it. For the floors, connect bricks_002_color_2k.png to the bottom layer's file node and set 3D Placement scale to 150 in XYZ. For the plaster layer use plaster_015_yellow_var1_color_1k.png and do the same for the scale. Use the same blend mask from when we blended the displacement.



13 Tweaks and more MARI masking Rebuild the same shading network for the basement. Use bricks_018_capuccino_var_01_color_2k.png for the base layer and plaster_030_beige_var1_color_1k.png for the second layer. Same thing with the blend mask. Now, to generate a little more visual interest you can do something like this: put a HSV node between the projection and the LayeredTexture, and play around with the values. Put the layer on top of the plaster and paint a mask in MARI. Plug the mask into the layer's Alpha slot to create more colour variation. Redo this as often as needed.

14 Paint a waterline Create a new channel in MARI. Select the basement's UDIMs and fill them with black. Create a new layer. Grab some reference pictures and decals of moss and grime, and load them into MARI. Start painting a waterline using the Paint Through brush. Use the ortho view in conjunction with lock panning to the x axis and Repeat mode to make quick progress. Use separate layers for each texture to be more flexible. Once you're done, hide the black fill layer and export the layer flattened as a PNG sequence. Keep the Alpha and only export the selected patches.

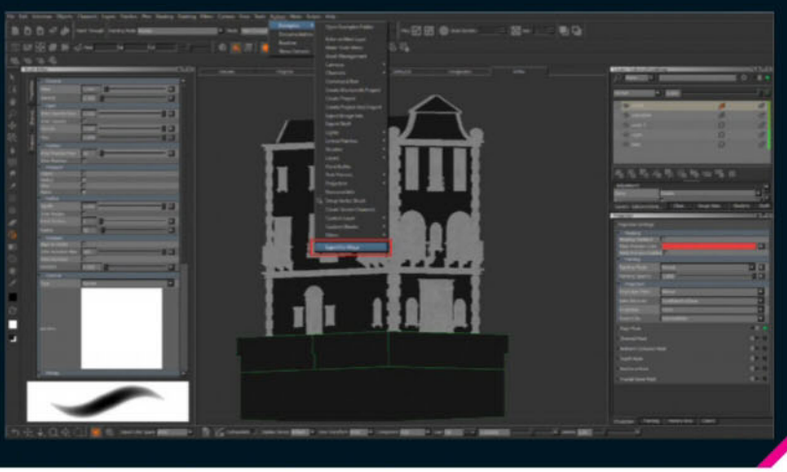
Preview render of our shaded building

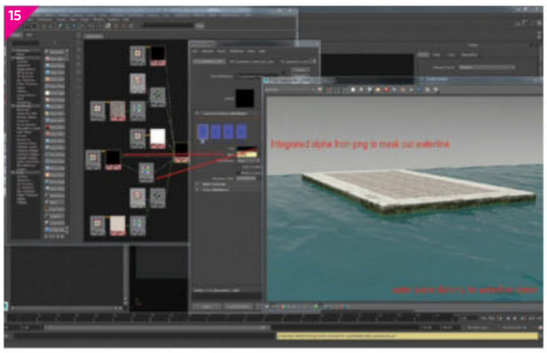
Our asset at each stage, from start to finish

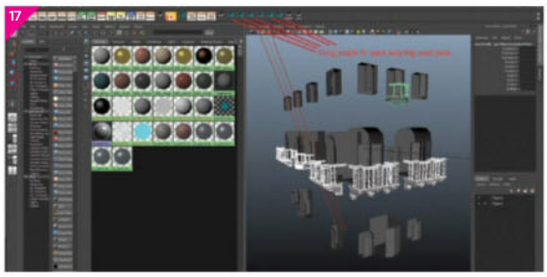
A wireframe of our asset

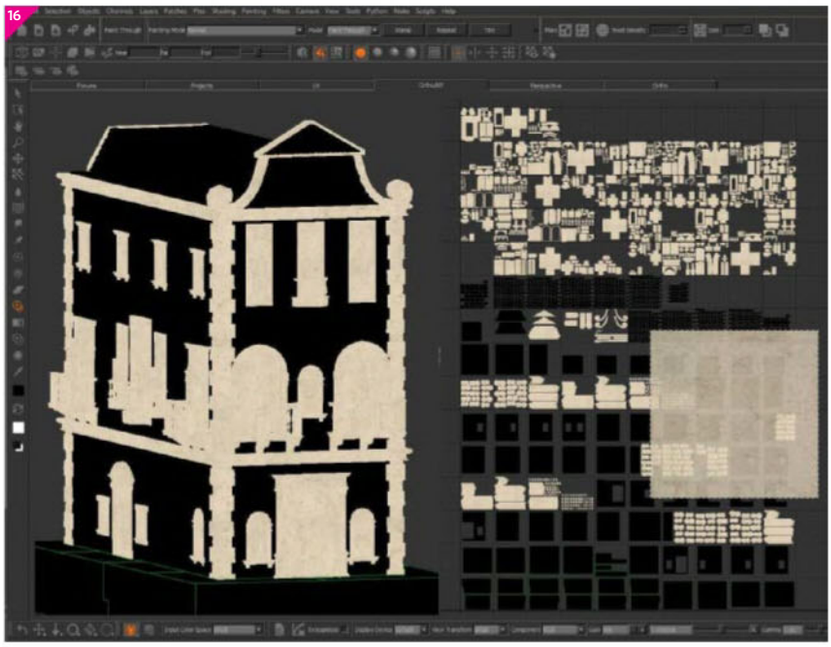
Alternative MARI export

Instead of manually entering the <UDIM> string in Maya for each file node, you can use a script in MARI that automatically generates a shading network for you (you'll find it under Python>Export>Export for Maya). This network contains all UDIMs combined in a LayeredTexture which is connected to a standard Blinn shader. The LayeredTexture will have a lot of inputs so it might be more convenient for you to make an asset out of it. This method can help in situations like distributed rendering, where you would otherwise run into path resolving issues.









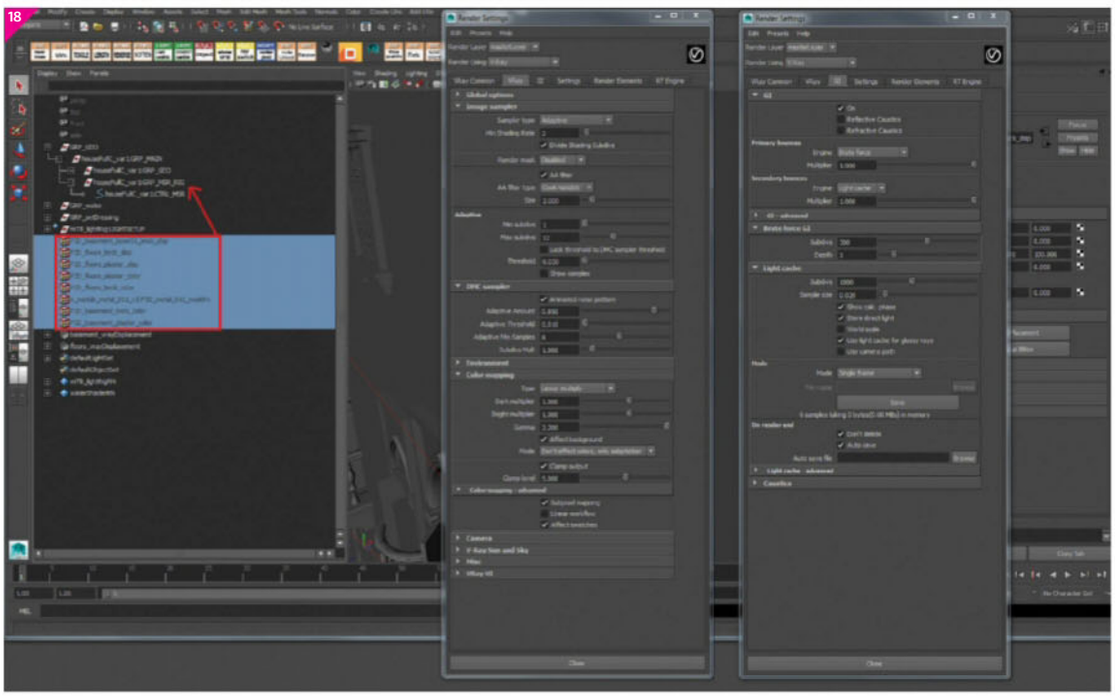
15 Add the waterline layer Create a file node in Hypershade and browse to your waterline image sequence. Again, replace the frame number with the <UDIM> string. Plug the file node's outColor in the HSV's colour port and put it on top of the basement material's LayeredTexture. Use the file node's outAlpha as the layer's Alpha channel. Use the HSV node to colour correct the layer until it matches the overall look of the building.

Keep an eye on displacement

Always be careful with multiple displaced objects in your scene, especially when their values are set pretty high. The more displacement you stuff in there, the heavier the workload for your machine or farm is going to get. So instead of buying lots of RAM, try to work efficiently and only turn on displacement for objects that really need the detail. Whenever an object is far enough away from the camera or is occluded by characters or other objects, do yourself a favour and switch displacement off.

16 Create the stone Paint a stone texture in MARI for the building's corner stones, balconies and windows. Export the channel, plug it in a LayeredTexture and put a V-Ray dirt layer on top which you set to multiply. In MARI, duplicate the stone channel and use levels and saturation filters to turn it into a bump. Export it and use it in your stone material. Give the material a slight reflection with a glossiness of around 0.8.

17 Assign V-Ray library materials Select your window doors and assign the wood material. Use the gold material for window decoration, door knobs and hinges. For chimneys use a mixture of brick and metal materials. For the roof tiles you can use an orange plaster texture as a basis, extract spec and normals from it using a tool like Knald, and tweak the colour with either Photoshop or a HSV node.



18 Final tweaks and render setup To finalise our asset, start by naming all of your shaders! Select all of your 3D placement nodes in the outliner and move them to the MSR_Rig inside GRP_GEO>GRP_MAIN. This way, all the projections will get exported with the model. Once everything is set, go to your Render Globals. For a decent quality render, choose a resolution of 1000 by 1500 pixels and increase GI brute force subdivs to 300. Turn on Light cache as secondary bounces with a subdiv value of 1000. Use Light cache for glossy rays. You can also increase the reflective material's reflection subdivs to at least 64. Done!

All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

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SCOTT EATON
Facial Anatomy Ecorche, 2015

Software
ZBrush

Learn how to
- Locate the important landmarks of the face
- Locate and study the function of the skeletal muscle
- Review the influence of subcutaneous and deep fat deposits of the face
- Construct the eyelids and surrounding orbit
- Shape facial muscles according to their influence on the form and expression of the face

Concept
This piece is intended as a reference guide that looks at the critical anatomical forms of the face, including skeletal muscles, eye and nose construction, muscles of expression and fat deposits.

YOUR FREE DOWNLOADS
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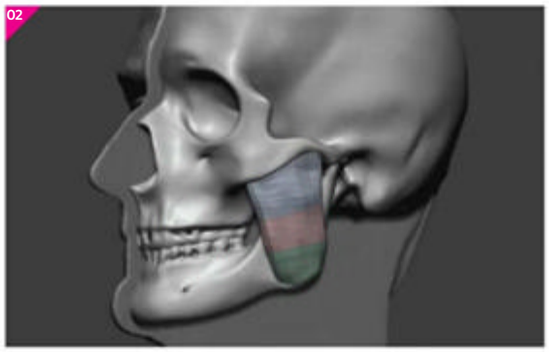
- Scene files
- Tutorial screenshots

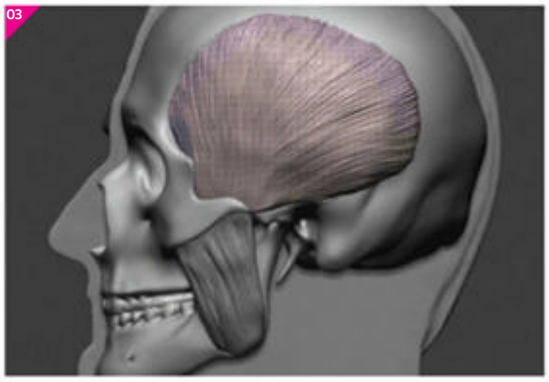
Master facial anatomy

Model an écorché study and pick up the fundamental anatomical structures critical to portrait sculpting

This tutorial walks you through the steps of blocking in an écorché study of the face in ZBrush. Écorché is the age-old practice of sculpting or drawing the body without skin in order to study the forms of the underlying anatomy. Here we build up the main anatomical forms of the face and discuss their importance to portraiture.

Sculpting or drawing a face is one of the most challenging things an artist can attempt. Most artists wander in the dark when creating a portrait – placing planes and locating features based only on observation and experience. With lots of practice this can lead to good results, but everyone can benefit from a road map that helps them work faster and better. Knowledge of facial anatomy is just that – a guide to the forms and regions of the face. The face, like the body, is a puzzle of interconnected anatomical pieces. Once the artist learns common shapes and connections he can quickly block in a likeness. The goal of this tutorial is to familiarise you with these common anatomical structures.





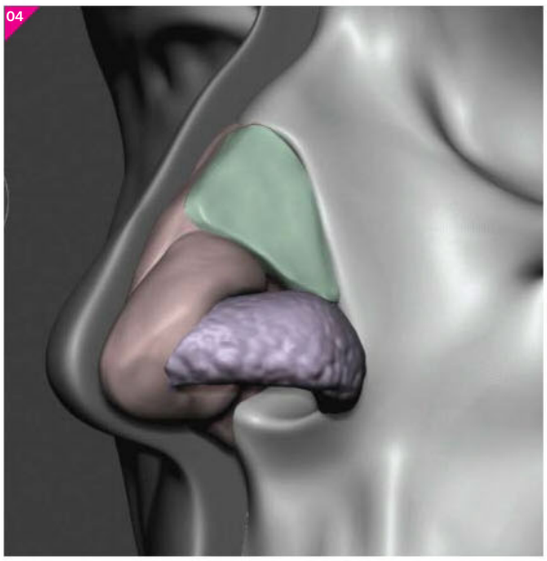
01 Fit the skull We first need to get the skull to fit the volume of the reference portrait supplied. Turn on transparency and adjust the proportions with a large Move brush. The areas of the skull that should be superficial (ie near the surface) are the eye orbits, the zygomatic arch (cheek bone), bridge of the nose and forehead. The rest of the skull has muscle, fat or cartilage between it and the surface. It is important to appreciate where the skull is closest to the surface so we can use these as landmarks when constructing a portrait.

02 Place the masseter The masseter is the first of two skeletal muscles that we need to place. Skeletal muscles connect bone to bone and articulate a joint (as opposed to facial muscles which articulate the skin to create expression). In this case we are connecting the mandible (jaw) to the zygomatic arch. The masseter creates significant surface form on the face and needs to be located correctly. In ZBrush, block in the shape with your preferred geometry creation method, then subdivide and detail.

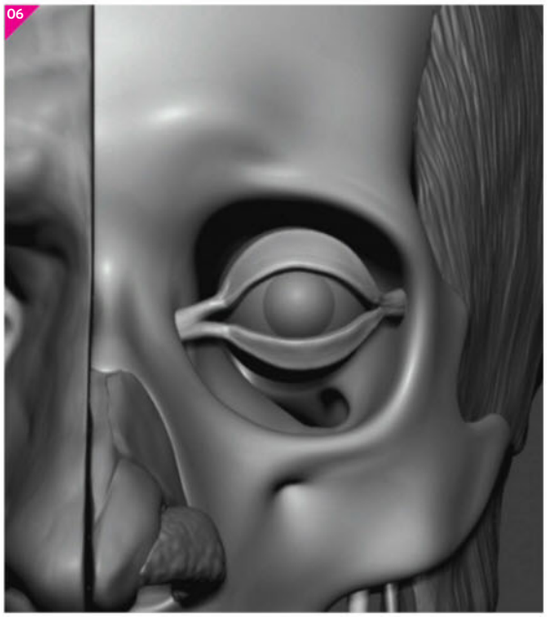
03 Understand the temporalis The temporalis is our second muscle of mastication (chewing). This muscle combined with the masseter, give humans a wider range of motion for biting and chewing. The temporalis is a large, distributed fan-shaped muscle that anchors to the skull along a crescent (the temporal line) that stretches from the upper-lateral corner of the orbit back to behind the ear. This distributed muscle body converges, focusing its power, and passes behind the zygomatic arch, grabbing onto the anterior point of the mandible called the coronoid process.

Geometry creation
In this tutorial we need to create a number of subtools for the various anatomical forms of the face. ZBrush gives us a smorgasbord of tools for creating geometry, so how you proceed is up to your own workflow and preferences. For this exercise I used a combination of ZSpheres with adaptive skin, the new QCube (under the Tool>Initialize menu), and InsertMultiMesh Curve brushes. My workflow involves appending a very low-res mesh that I can pull and shape with the Move brush, then I subdivide and detail using ClayTubes and alpha 54 or similar.

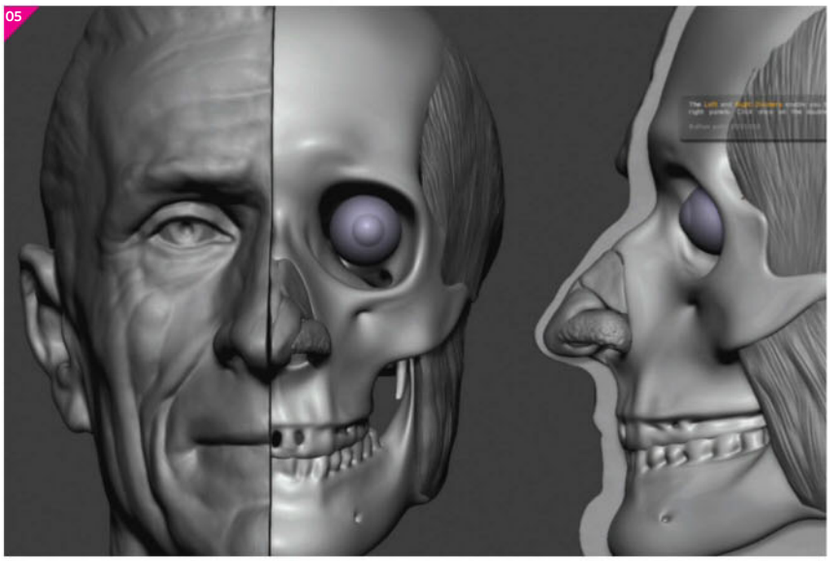
“The masseter creates significant surface form on the face and needs to be located correctly”



04 Construct the nose cartilage The nose exhibits an amazing amount of variation in life. It is important to understand that despite this variety, all noses are built from the same three pieces of cartilage and a small bit of fat. The septal cartilage establishes the midline of the nose. The complex shape of the alar cartilage creates the ball of the nose, and the lateral cartilage creates the side walls of the nose. Finally to funnel in the air we have a wedge of fat that creates the nostril of the nose. Using your best construction skills, construct this geometry over the nasal opening of the skull.



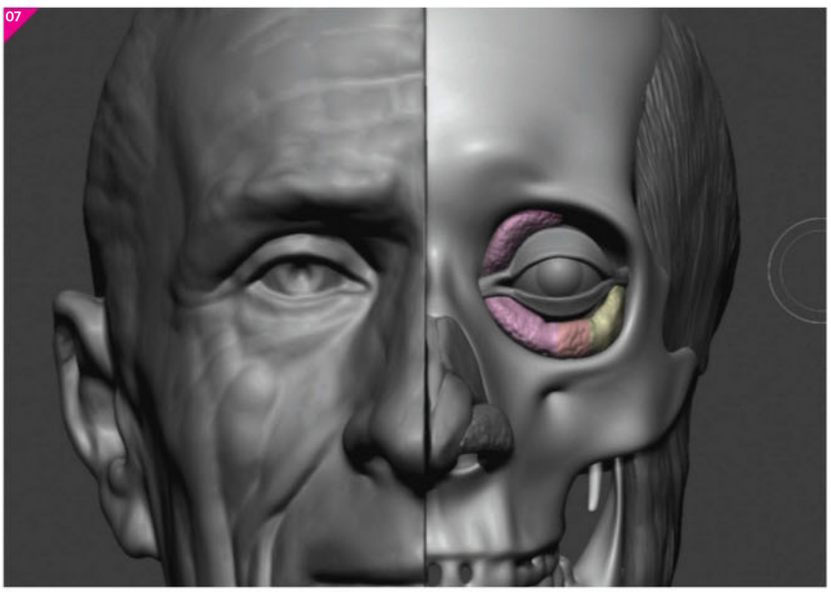
06 Make eyelids using tarsal plates The eyelids have two stiff plates of cartilage in them called tarsal plates. These form the foundation of the lids and are anchored to the orbits by something called the canthal ligaments. The medial (inner) canthal ligament is visible on the surface and so creates important surface form, the lateral one attached inside the rim of the orbit and is not visible. Paint a mask on the eyeball and then use Subtool>Extract to make your tarsal plates. Use your favourite geometry creation method to place the ligaments, then DynaMesh the result together.



05 Place the eyeball An adult human eyeball is approximately 24mm in diameter, there is small variation in this but it is a very useful average. The most common mistake in people's portraits (in CG anyways), is that they always make the eyeball too large, wedging a grapefruit into the orbit and then trying to get the eyelids to fit properly. Here, with a correctly sized sphere (do it visually as our skull is not to scale) centre the eye in the orbit, and move it forward to the point where the bone of the orbit still protects it.

Getting facial fat right

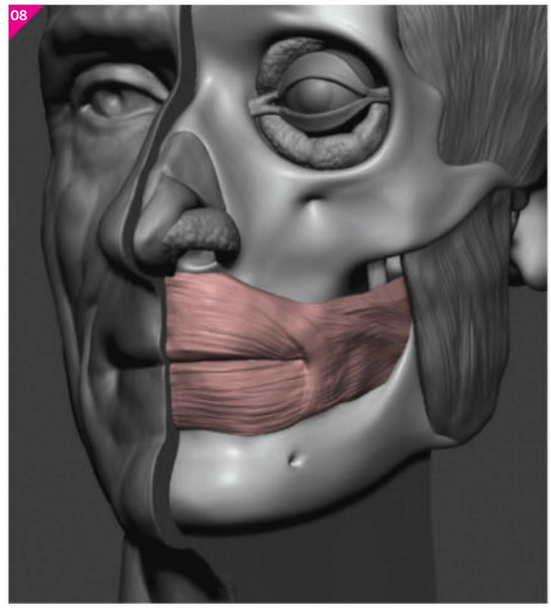
Not many artists appreciate how significant the fat deposits of the face are to the character of a portrait. In fact, almost every écorché study omits them. Fat is responsible both for the beauty and softness of youth as well as the craggy hollows of old age. In dissection, fat looks quite a bit like kernels of corn. To achieve a fatty texture in ZBrush use the Standard brush with Stroke set to DragRect and a suitably fatty alpha. I used alpha 62 with judicious use of the Smooth brush to texture the fat on this piece.



07 Construct orbital fat With the eye and lids in place you can see the large cavity we need to fill with orbital fat. Orbital fat is packed all the way into the orbit and is what cushions and holds our eyeball in place. With age we can see this fat pushing out of the orbit, giving us characteristic bags under our eyes. Construct half a donut of fat and locate it in the space between the tarsal plates and the rim of the orbit.

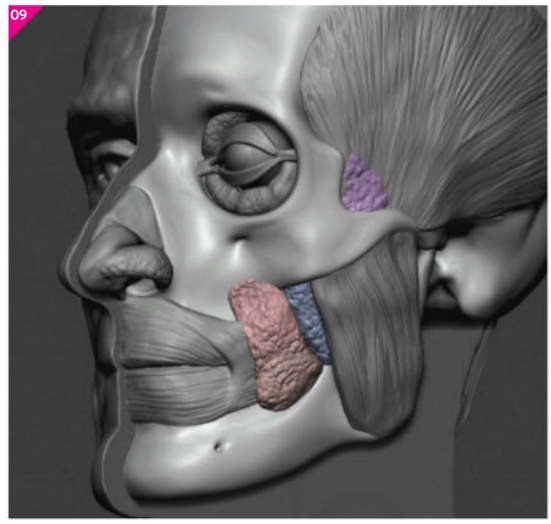
08 Put in the oribicularis oris

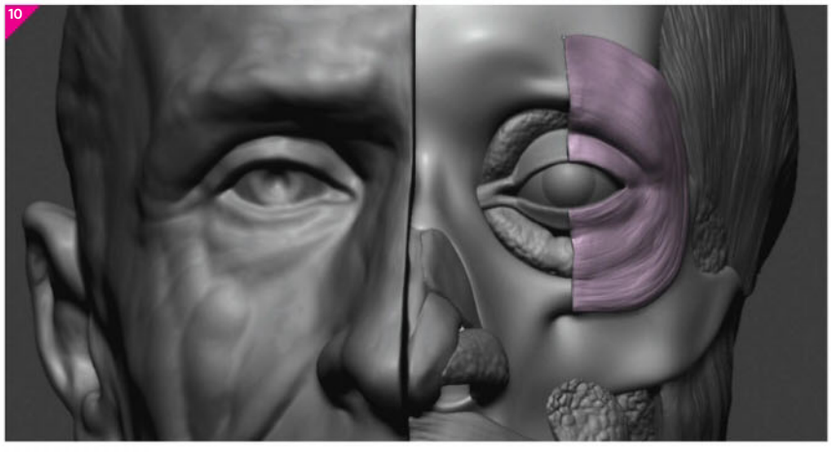
Our lip/mouth muscle is the first of two orbicular (circular) muscles on our face, made of concentric rings of muscle fibres, which pull inward in various combinations to make a variety of lip shapes and phonemes. The muscle is extremely complex as many surrounding muscles will pass fibres into it. Here we show the deep cheek muscle, the buccinator, merging into the orbicularis oris from the sides. The buccinator originates above and below the molars and passes fibres into the deep section of the orbicular muscle.



09 Make deep cheek fat pads

There are a couple of fat pads in the deep recesses of the skull that act as cushions for the facial muscles. These deep cheek fat pads sit over the buccinator and squish out into the depression in front of the zygomatic bone and a bit above the zygomatic arch. The volume of these fat pads determine the size of the hollow in a person's cheek. The man in this portrait has very hollow cheeks so keep the volume small as you construct these fat pads.





10 Cut orbicularis oculii The face's second orbicular muscle covers the orbit and eyelids and is responsible for blinking, squinting and raising the cheek. It extends quite far over the orbital rim and wraps medially to attach to the medial canthal ligament. Here we have cut away the medial half of the muscle to keep the orbital fat and tarsal plate exposed. Use ZSpheres or an IMM Curve brush to get geometry wrapping around the orbit, then flatten it and DynaMesh it. Use the TrimRectangle tool to cut off the medial half.

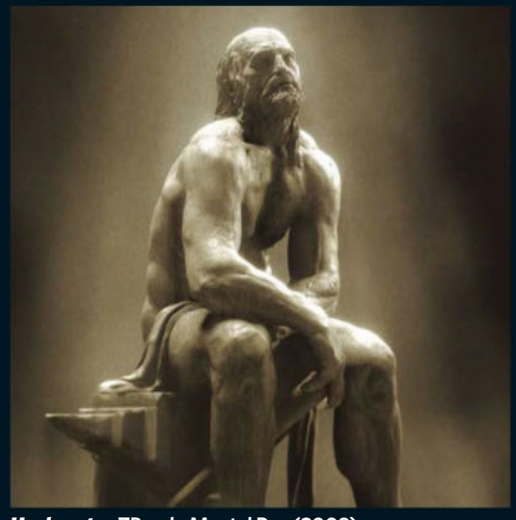
Showcase

Scott Eaton

Scott Eaton is an artist, character supervisor and anatomy instructor living in London, UK. He is a classically trained sculptor who has been teaching anatomy to digital artists for over a decade. Scott also contributes his expertise to film and commercial VFX and he has worked as lead modeller and character supervisor on numerous films. He has taught anatomy to studios around the world including Industrial Light & Magic, Valve, Framestore, Ubisoft and many others.

Torso Studies **ZBrush, Mental Ray (2014)**
Study of the articulation of the shoulders and back from Scott's digital figure sculpture online course.

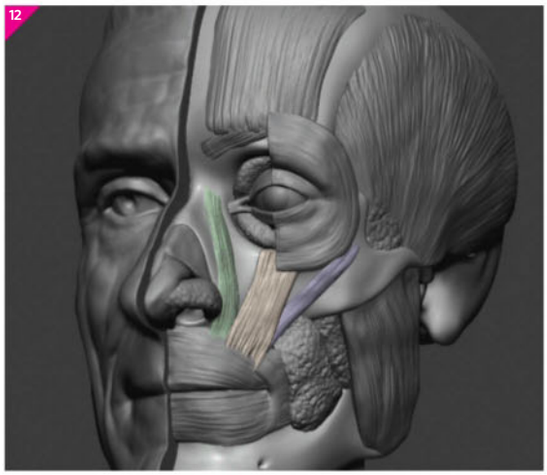
Mermaid Study **ZBrush, Mental Ray (2011)**
Unused mermaid concept sculpt from *Pirates Of The Caribbean.*



Hephaestus **ZBrush, Mental Ray (2009)**
Digital sculpture of the Greek god Hephaestus. Hephaestus was the crippled blacksmith of Mount Olympus, shown here in repose at his forge.

11 Build forehead muscles – temporalis and corrugator These two muscles are important contributors to the expressions of surprise, anger and sadness. They are thin muscles so they don't create surface form but we certainly recognise the expressions they create. For the temporalis, create a flat sheet of geometry from just above the orbit to the top of the forehead. Medially it stretches almost to the centre, laterally to the temporal line. The corrugator is a small diagonal muscle that spans the space between the base of the nose to a point approximately mid-eyebrow. Place this using a small piece of geometry.

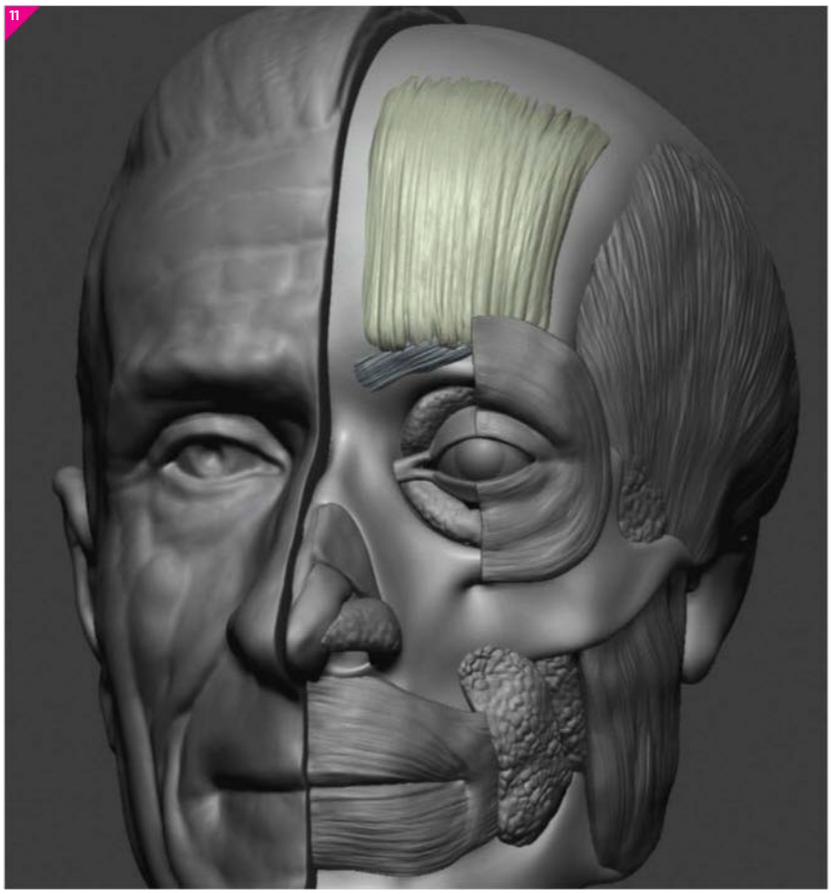
12 Lift the lip The human face has a network of muscles that articulate the upper lip. The muscles anchor into the upper edge of the orbicularis oris muscle (as well as intermingling fibres into the lip). They are called (from left to right): levator labii superioris alaque nasi, levator labii superioris and zygomatic minor. They are respectively responsible for wrinkling our nose, sneering and subtly deepening the nasolabial furrow (the furrow that comes off the nose and proceeds down by the corner of the mouth). Construct these like little pieces of linguini. Note: there is also a sneaky corner-lifting muscle not shown here.

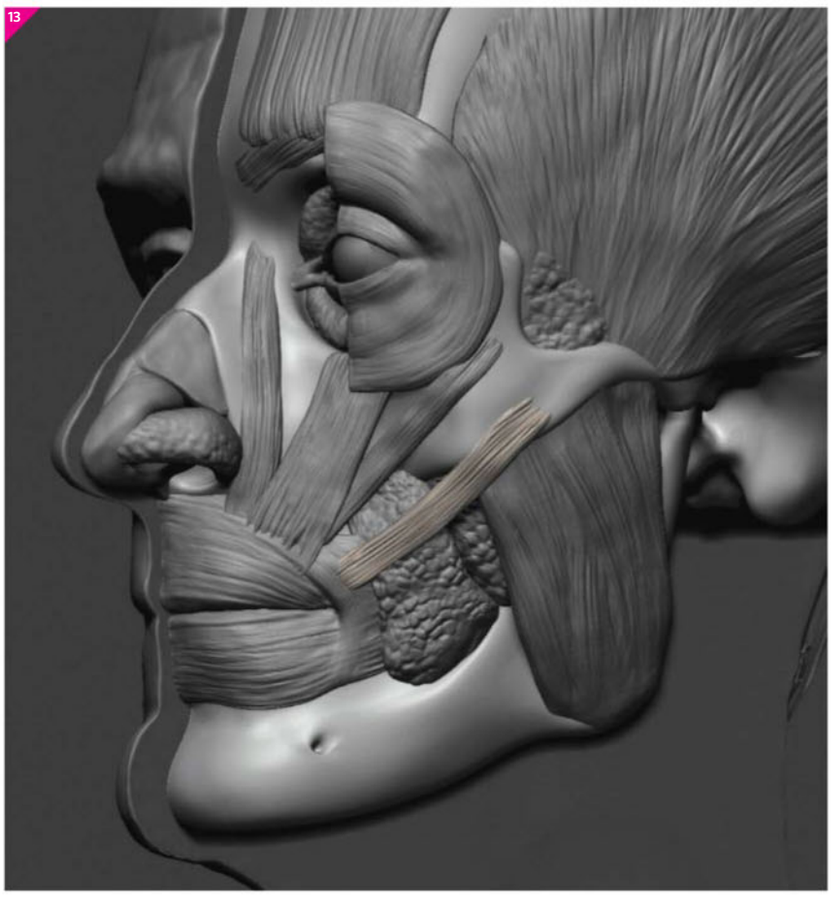


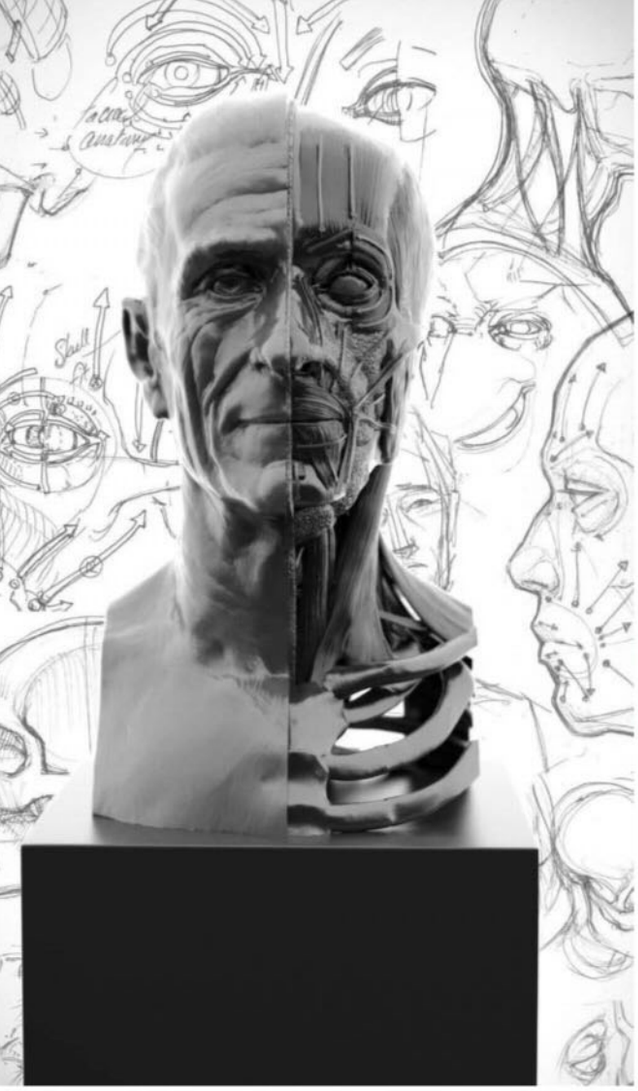
13 Construct the zygomatic major The muscle, zygomatic major, is our smile muscle. It can be difficult drawing or sculpting a smile but once you understand the origin/insertion and action of this muscle, the construction of the smile becomes easy. Build this muscle from the corner of the mouth out to the lateral surface of the zygomatic arch. It has the widest pull of any of our facial muscles and lifts and stretches the lips when it activates, creating a big smile.

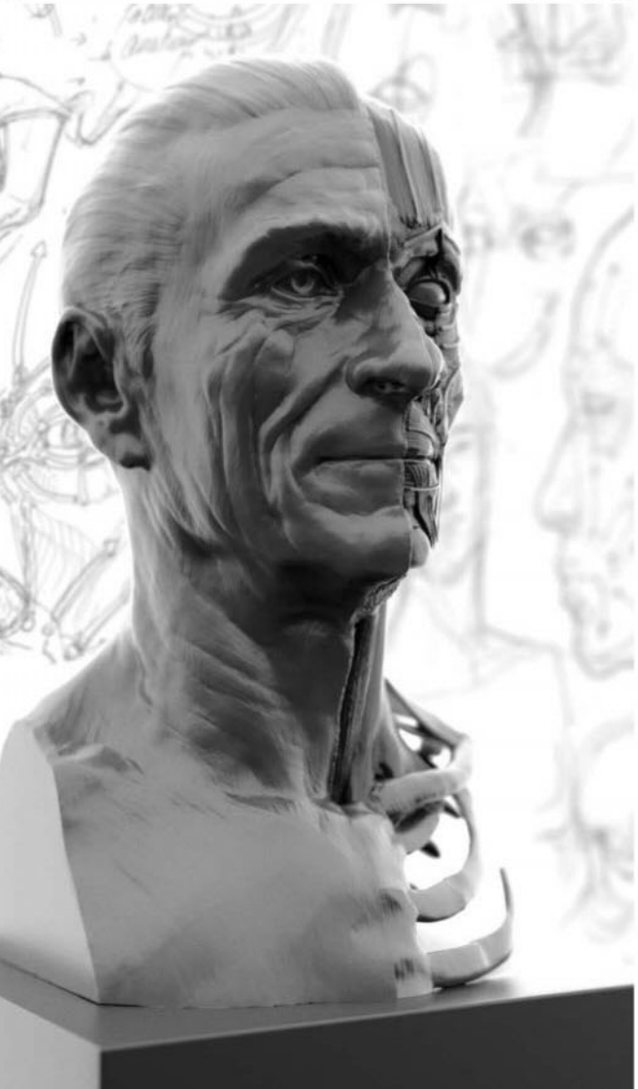
Facial muscles

Facial muscles often create very little surface form so you might think they aren't interesting to us as artists, but we absolutely need to know them because of the expressions they make. Once we know the construction of the muscles, ie the origins and insertions, we can derive the expression it creates. Each muscle also has characteristic wrinkle patterns that we are programmed to read, even when very subtle. There is a lot to learn about expressions but the best way to start is by studying the underlying musculature.

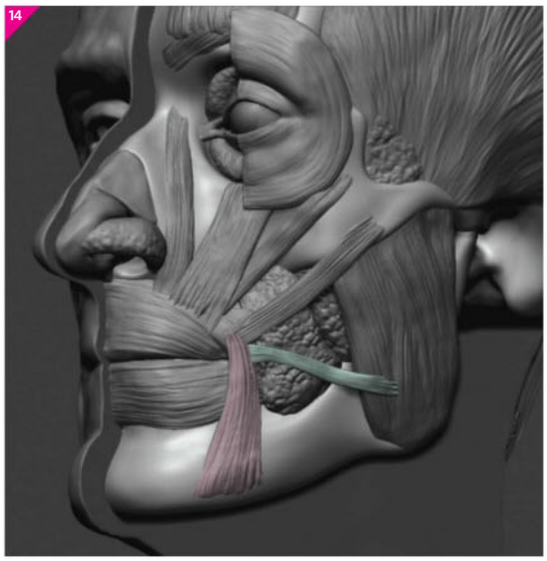




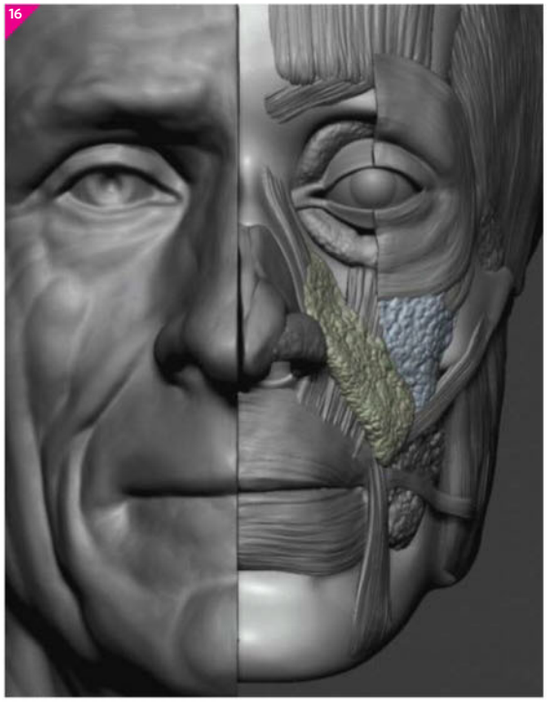




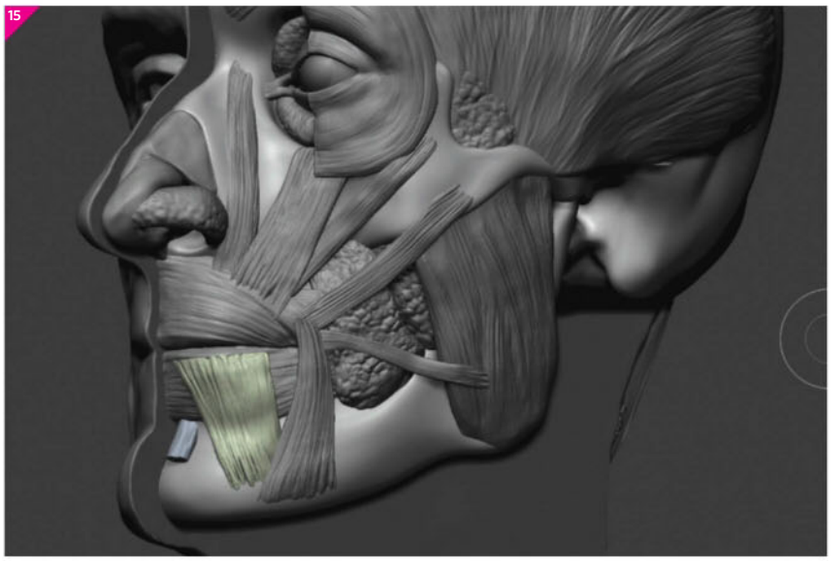
“For the temporalis, create a flat sheet of geometry from just above the orbit to the top of the forehead. Medially it stretches almost to the centre, laterally to the temporal line”



14 Pull down corners Just as we had zygomatic major pulling the corner of the mouth upwards to create a smile, we have a corner depressor called depressor angulii oris, that pulls the corner down to create a frown. This muscle pulls on the corner of the mouth but also passes fibres into the upper part of orbicularis oris. Some of this form can be visible on people's faces. A second small, but related, risorius muscle pulls the mouth wide and slightly downward. Unusually, it originates from the skin over the masseter.



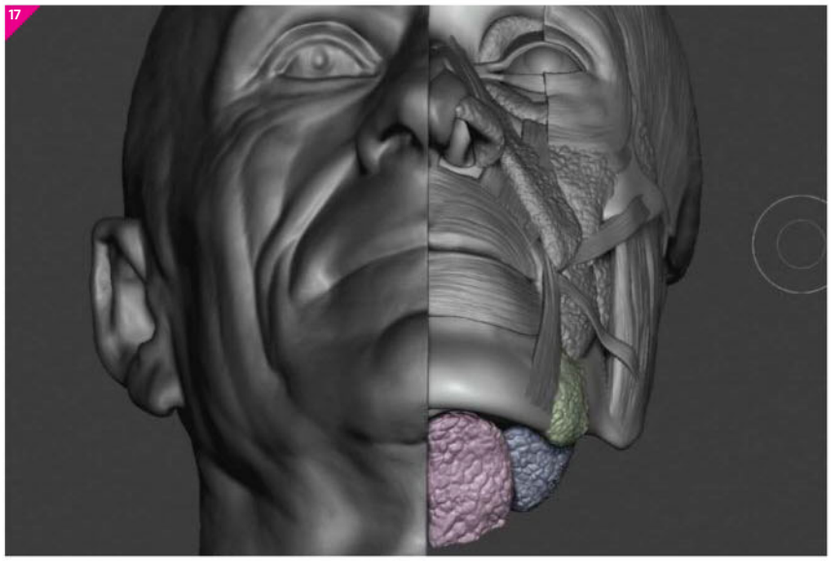
16 Construct the malar and midcheek fat Now that the muscles of expression are in place we need to cover them with subcutaneous fat. We have a critical fat pad, called the malar fat pad, that is located below the bottom of the orbit and lateral to the base of the nose. It helps create the nasolabial furrow. As we age it sags and separates from the other subcutaneous fat deposits. Here we also construct the triangular mid-cheek fat pad, also quite defined on our model.



15 Depress the lip and lift the chin The opposite of the upper lip lifters (Step 12) is the lower lip depressor, depressor labii inferioris. It anchors onto the jaw just inside the depressor anguli (Step 14) and then ascends, grabbing onto most of the body of the lower lip. This flat sheet of muscle retracts your lower lip showing your bottom teeth. Adjacent to this muscle is the last muscle of the tutorial: the mentalis. This funny little muscle anchors between the lower teeth and chin, and grabs onto the fat pad that covers the chin, raising it when activated. It is shown cut away here.

Final thoughts and continuing study

We have come quite far in a 17-step tutorial. I tried to fill it with useful anatomical information but space is short. I hope this tutorial has excited your interest in facial anatomy and that you can appreciate how knowledge of facial structure can improve your portraiture. There is so much more information to cover on all fronts but we will leave that for another time. If you would like to learn more, I refer you to my website (**scott-eaton.com**) where I have a number of additional resources to help you continue your study.



17 Build the submental fat and jowls The last few characteristic fat deposits are located on the lower face and under the chin. The submental fat compartment, our double chin fat, is constructed underneath the chin. Be careful not to extend it out too far to the sides, nor too low. Adjacent to this are a pair of jowl fat compartments, one above and one below the jawline. Construct these like small parcels of fat that gravity has had its way with over time.

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				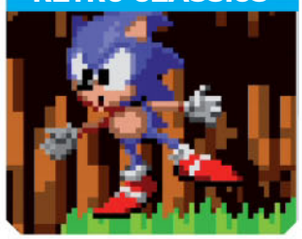

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SOLIDWORKS, SKETCHBOOK PRO

Model industrial designs

Product design has several steps and processes that should be adhered to when making a successful product, and by following the next steps you can increase the percentage rate of success – from concept to completion.

By evaluating and identifying the problems within the market, we will be able to develop new ideas and solutions that can solve these drawbacks. These ideas can arise by focusing on the lack of solutions in the market or else by improving a product already made that does not work as it should.

Next, when it comes to researching we need to ascertain if there are any similar products that have been previously manufactured, in order to prevent the making of replicas. Here you should work on identifying problems within current products and try to improve them. After the researching stage, you can start coming up with concepts and ideas that can bring new solutions. This is where sketches are drawn of a product that will be functional in the market.

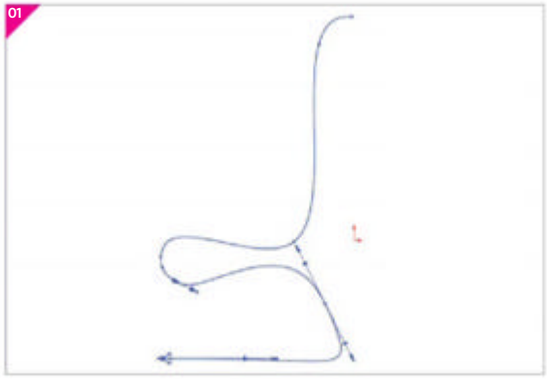
Then we need to look at the feasibility phase: this step must be highlighted. A team of engineers and technologists must prove to the management team that all is working correctly, before creating a commercial product, by using prototypes that work via 'proof by existence'. In the prototype stage, the designers must turn their sketches into 3D designs to represent the product in all angles and set forms, and it is noteworthy that they don't need to be functional at this stage.

In the prototype revisions step we need to check the correct dimensions, construction, features, appearance, functions and so on. Experts and customers should do exhaustive testing. It is important to take a look at the product details and create an attached revision documentation.

If all of the previous stages have been successfully completed and approved, it's time to continue with the manufacturing process for the product.

Make sure you take a look at the video for this tutorial on FileSilo and the detailed steps below, where we teach you how to design 3D products in SOLIDWORKS.

01 Create the base shape Firstly, activate the current view as 'right' (via the small cube in the viewport). Then, go to the Sketch tab and there you can find a list of small icons, some of these are named 'spline'. Click on this icon and try to re-create the shape like the image in the screenshot below. Keep in mind that you need to drag and drop the spline points but try to draw a point, then drag and click. Using this process, you can create something like what we've created below. If you created a lot of useless points, click on the points and delete them.



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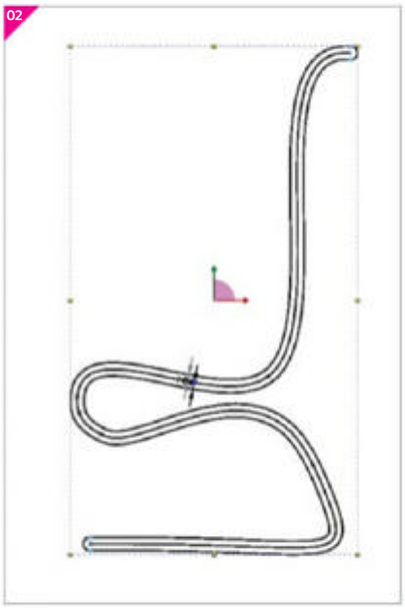
02



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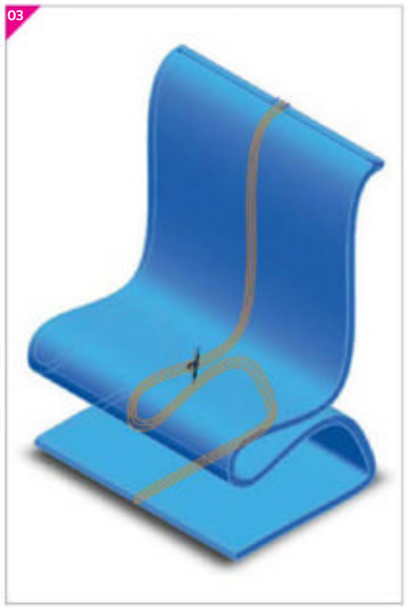


04

02 Use the Offset Entities tool This tool enables us to add sketch entities by offsetting faces, edges, curves or sketch entities to a specified distance. This is perfect for creating an outline from our first spline done in the previous step. This will create a new rounded contour for extruding in the next step. To create this, you need to edit the current sketch, and click on the icon Offset Entities in the Sketch tab. In the Parameters tab you should set a low value because if you use high values some points may overlap. Check the option of Bi-directional and Cap ends.

03 Extrude the surface Now we need to delete the first spline done in Step 1 (middle spline) and keep the rounded outline. Then, we will need to extrude the surface. Enter the sketch now and go to Menu>Insert>Boss/base and select Extrude. Select Mid Plane in Direction 1 and then underneath it, put in a value – something along the lines of 110mm – in D1. These values are references for this tutorial, but you can increase the measurements according to your own personal tastes or product. Now you will have to confirm the process.

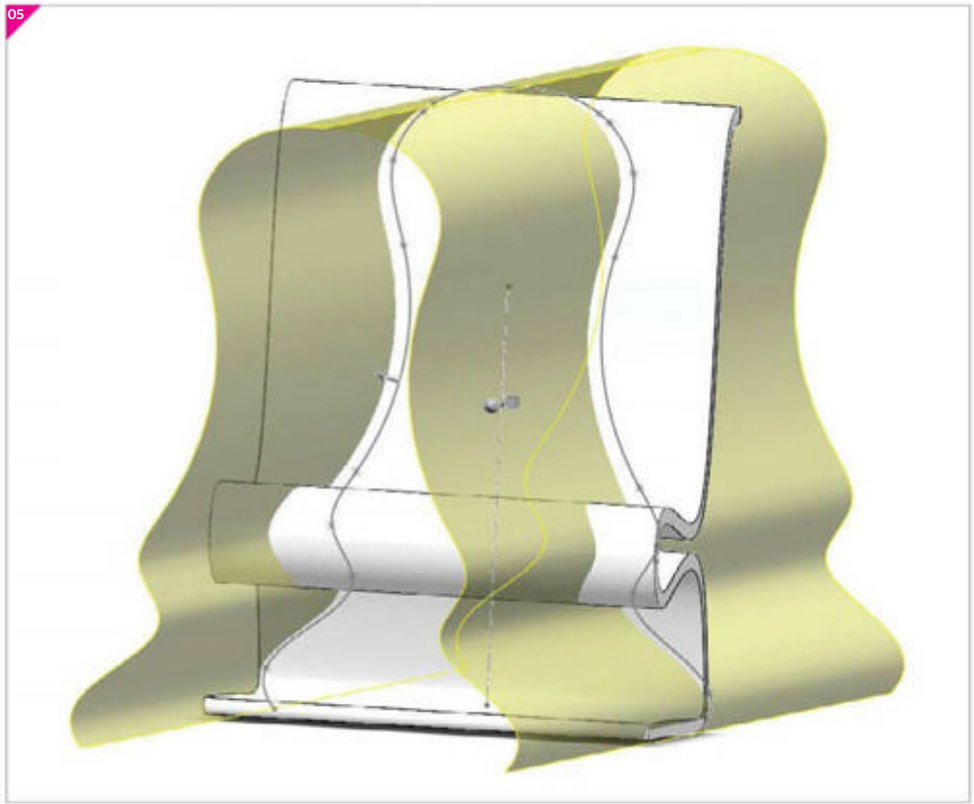
04 Create a new contour This new spline will be used as an extruded cut. Now you need to change the plane and in this case we have changed it from right to front. Then, using the same process as we have for the previous steps, you need to create a similar spline as the current image for reference. You need to create the middle of the entire shape and a vertical central line in the middle of the chair. Then, select the spline that you've created and click Mirror Entities. In the 'Entities to Mirror' slot, select the spline and in mirror about you will need to select the centre line.

05 Cut the shape If in the previous step some points are unwelded, you need to edit the sketch, select both points and right-click. There you will see a menu with a small icon of two lines joined in a point. Click on this icon and now cut the shape over the other axis. These cuts are perpendicular. Select the sketch, go to Menu>Insert>Cut> and select Extrude. In Cut-Extrude go to the Direction 1 slot and select Through All and check 'Flip side to cut'. To get a preview of what you've done so far, click on the glasses icon.

Axonometric and isometric

Axonometric projections could look a bit distorted but these projections work great for interior rooms or buildings. Axonometric projections go in three different axes directions: vertical and 45 degrees left and right. Isometric projections go in vertical and 30 degrees left and right. It's important to clarify that these projections don't exist in reality – they are views without perspective. Unlike in reality, the segments in the distance keep the same scale as everything in the foreground, giving an isometric view. In reality these segments are larger or smaller as they extend closer to or away from the viewer.

05



06 Get the shape Once you have used the option of Cut-Extrude we will reveal the final shape. This shape can be modified – by going to 'FeatureManager Design Tree' and then Cut-Extrude, you will find that the sketch can be modified by moving the points of the spline. Keep in mind that some of these points have relations and these relations don't let us move about freely. So to solve this problem you will need to click on the green icons around the points and delete them. You can also change the relations of those points with other points.

07 Chamfer the edges This option will enable us to improve our model. Firstly you don't need to select all the edges around the chair, you only need to select the back edges. Select the sky-blue edges (you can take a look at the screenshot to the far right as a reference). Now go to Insert>Features> Chamfer and use these parameters: 5 for Distance and 45 degrees for the angle. You will get a preview of the final shape with a yellow line as you can see here. Modify the values according to your personal preference and after this, click on the green tick.

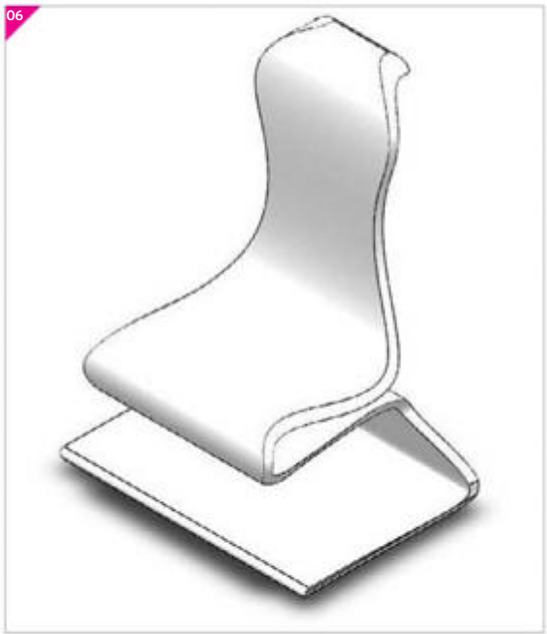
08 Appearance, scene and decals In the top of the viewport you can see some icons – click on the icon that has been marked with a red circle in our screenshot below. There you can change the studio lighting. We've used '3 point green' and a wood material. To change the material, right-click on the object and you will see an icon named Appearances. A new menu will be open and you will see a small icon with a texture on there. Left-click it and a new menu will be opened with all the materials appearing on the right-hand side.

09 Render and technical planes The final step is the rendering, so click on the SOLIDWORKS Add-ins tab and there you will be able to see an icon named Photoview 360. This option will activate the render options by the right panel. To create planes, you need to click on the 3D views tab at the bottom. Change the viewport orientation, and capture the view. Do this for the three views. Then, open a new document as a drawing one and import the views to go over the plane.

Interesting featured tools

In my particular case I recommend you take a look at some great tools that I've found in SOLIDWORKS, which are Extruded Cuts, Mirror Entities, Swept Cuts and Project Curves. Project Curves is one of the greatest tools because you can create a spline over a plane, and if there is any object behind the plane of that spline, you can project this spline over the object. If the object is curved, the spline will be adapted to the object creating cleaned cuts. This is perfect when combined with Swept Cuts.

06



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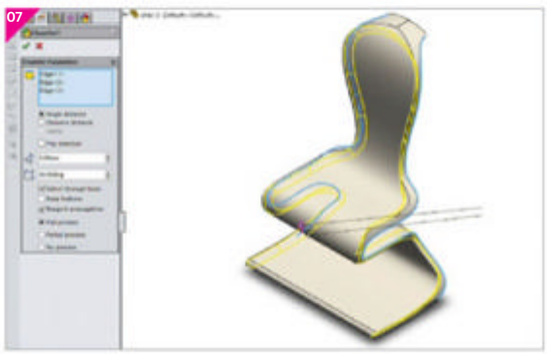

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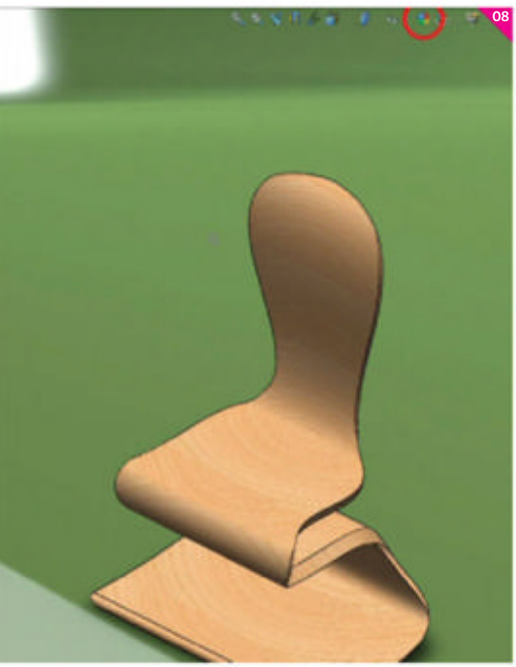

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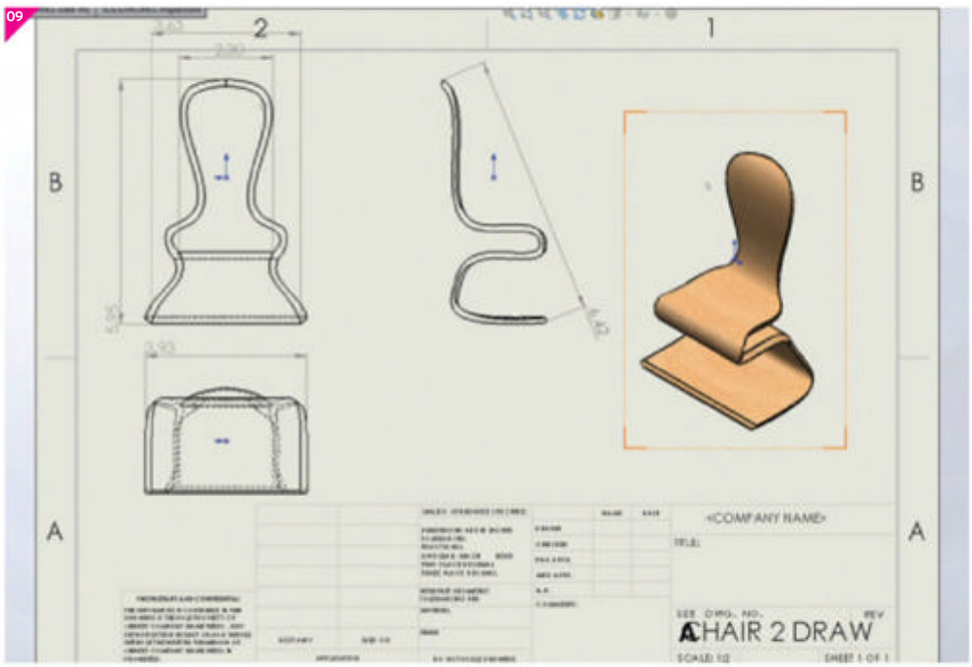

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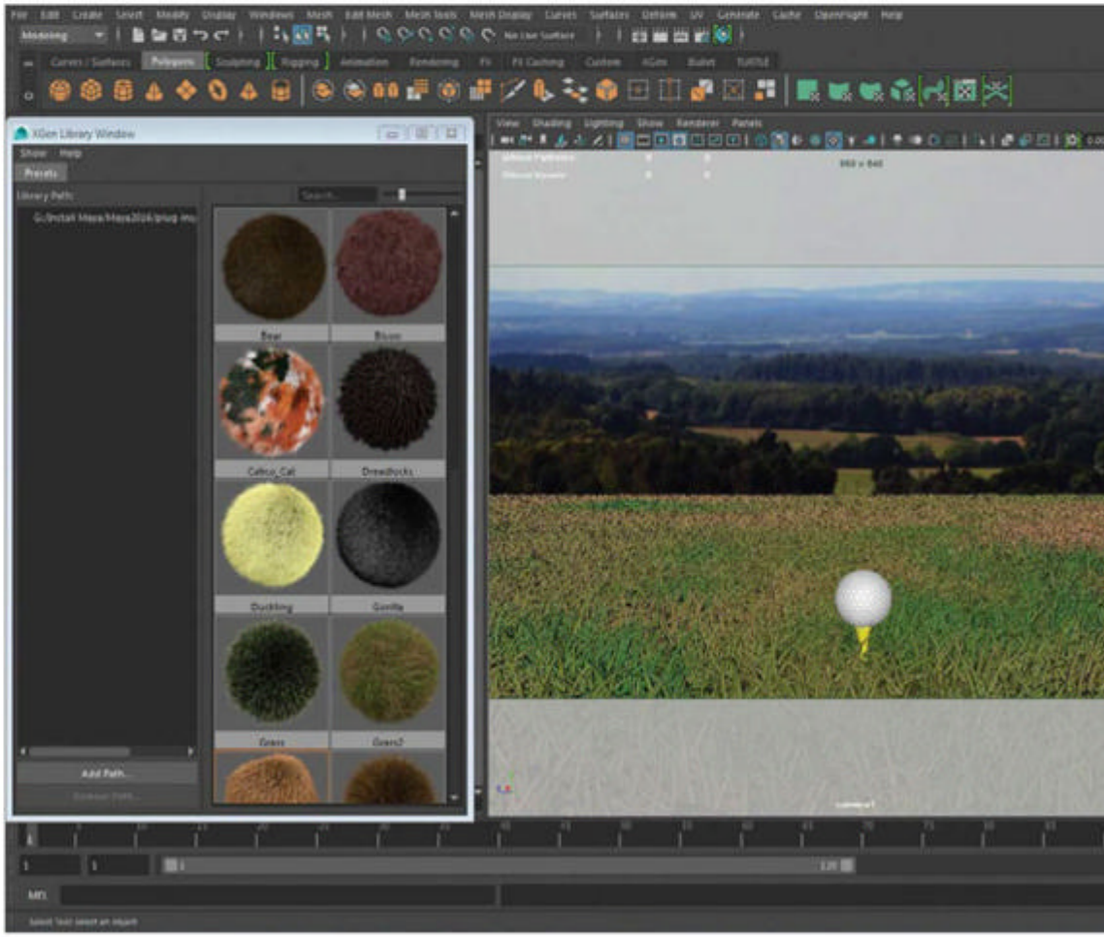
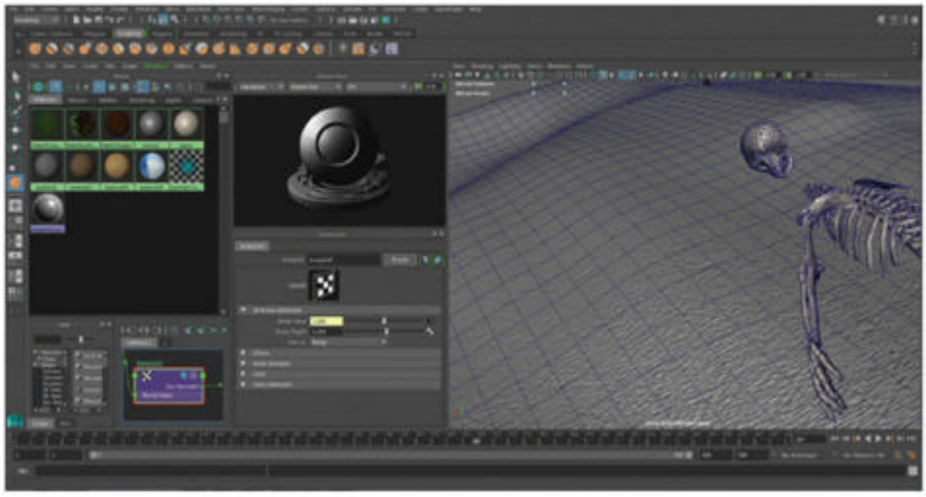
Maya 2016

New features, performance improvements and a welcome digital makeover revealed





A new version release is always exciting, but before you dive in, you'll need to reacquaint yourself (again) with interface changes.

Visually there's not much to worry about. There are updated shelves, a new colour scheme and tweaked icons. If you need it, the interface will scale in resolution, which maybe handy if you're giving demos or in a classroom environment for example. Layout changes to Menu Sets and Menus naturally take a while longer to adjust to, but if you're hopelessly lost, there's a useful Find Menu Item tool or you can roll back changes to a previous version.

Impressive revamps to the Hypershade make its older version look very tired. It feels like a Hypershade 2.0, and far more adept for look development. Quite simply, it looks fantastic. The new Material Viewer works in real-time for shaders, bump maps and 2D textures. After selecting your renderer, there's a choice of objects to see the Material applied. You can then preview the result in HDR environments too. Underneath, is a Property Editor – these can be toggled between a Look-dev version of most common attributes or the traditional Attribute Editor layout.

The Node Editor has replaced the old work area and supports multiple tabs for working on multiple shaders. Several other windows such as the Outliner and Texture Editor can be docked here too which largely spells the end of having to ferret around trying to find where you left windows. It's now also possible to one-click certain solo nodes via the Node Editor and preview what it is doing in the scene, which is ideal for troubleshooting.

Sculpting tools (derived from Mudbox) have been added which performed brilliantly for quick low-poly sketching, terrain generation and relatively high-poly modelling. When we reached around 6 million polys it may come as no surprise that Maya was less than happy with the process – so for higher-end sculpts you will still need to look elsewhere. But it does increase the amount of work you can do in Maya with fewer trips to Mudbox for simple tasks. Mudbox's texturing tools have been left out, but in the Visor you'll find stamps and some base meshes.

In the Deform Menu, the Delta Mush Deformer has been added to the roster. It's designed to help with skinning by smoothing deformation issues from bad skin weights. It's very easy to use with good results achievable in just a couple of minutes, and we suspect over the coming months that it will accompany the trusty weight hammer as one of our go-to skinning tools.

Rigged character animation also gets a boost via Parallel Rig Evaluation which is multithreaded. It enables Maya to utilise both CPU and GPU, speeding up playback in the Viewport enough to require less frequent Playblasting.

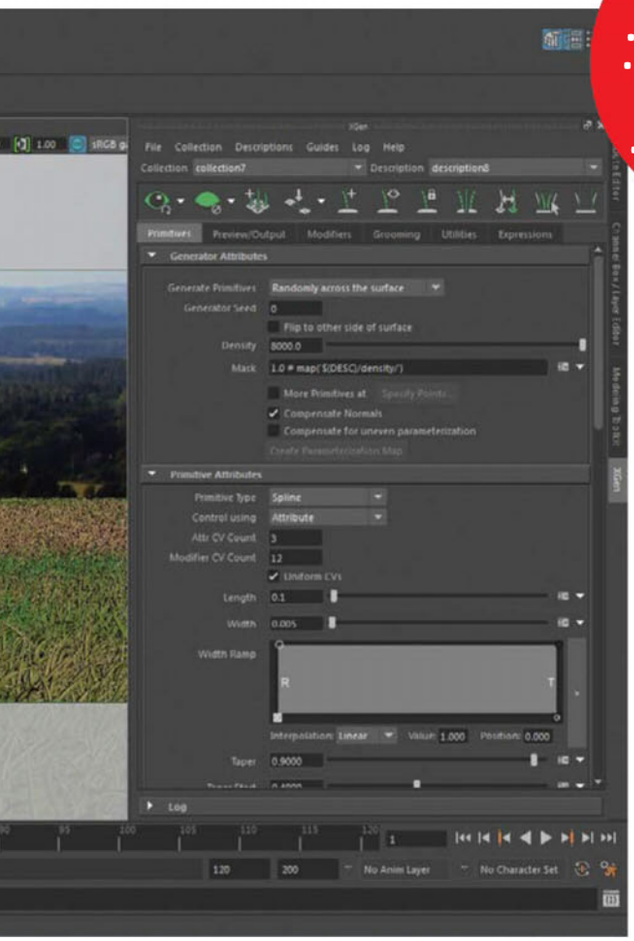
Relative newcomers XGen and Bifrost receive improvements in 2016 – XGen is now multithreaded and has a library (based on Maya Fur) which lets you start with presets to alter, it's very useful for hair and provides an alternative to nHair as guides can now be sculpted. Bifrost now includes an Adaptive Aero Solver for atmospherics (smoke and mist). Two effects we trialled were a large plume of smoke with fire from an old style cannon and a modern rocket launch smoke trail, but we struggled to create them and found the setup and testing rather time-consuming. The new Foam system produces good results, but has a plethora of settings to manage.

This well-rounded update removes many of the frustrations that have bottlenecked users in the past, and the highlight for Maya 2016 has to be the redesigned Hypershade, although we would personally like to see particle brushes added sooner rather than later.

Paul Champion

6 REASONS TO UPGRADE:

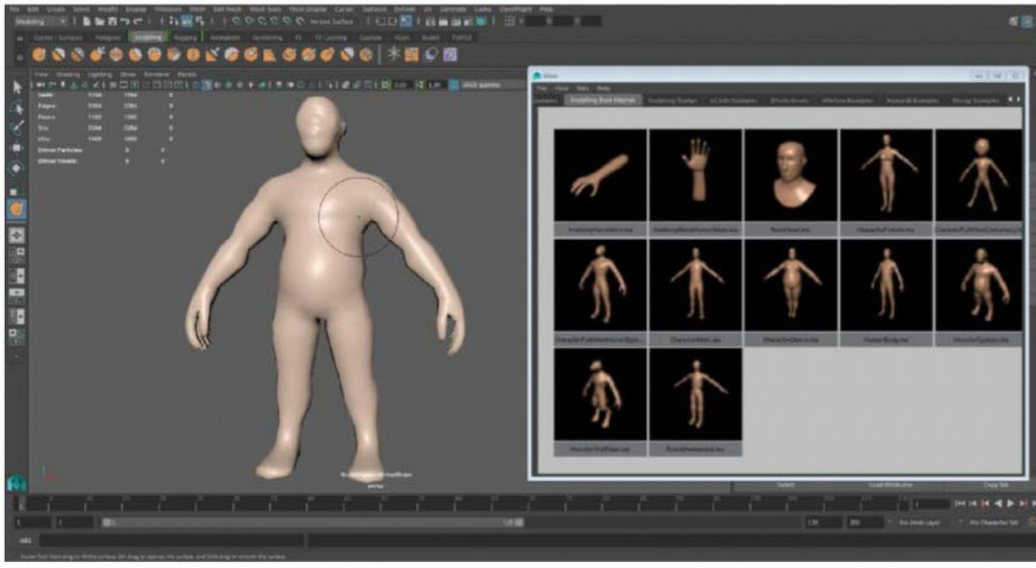
- Improved UI
- Mudbox sculpting toolset
- Updated XGen and Bifrost
- Delta Mush deformers
- Improved Hypershade
- Supercharged animation performance

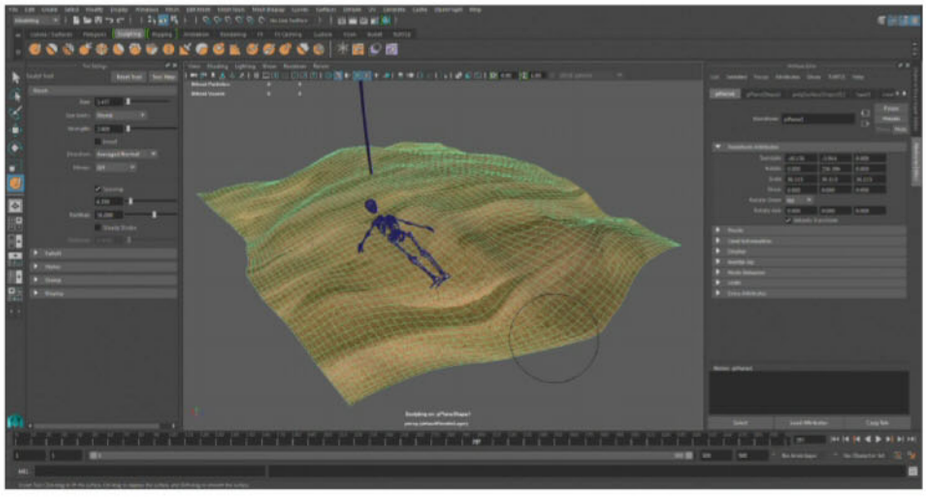


> Sculpting tools (derived from Mudbox) have been added, and performed brilliantly for quick low-poly sketching, terrain generation and relatively high-poly modelling

LEFT Performance boosts, new tools and existing upgrades mean you can spend less time working and more time playing golf!

BELOW Useful Sculpting Base Meshes for animals, bipeds, clothing, props, vehicles and weapons can all be located in the Visor





TOP LEFT The ability to view certain nodes in Solo mode using the Hypershade is achieved by simply clicking the S icon

TOP RIGHT The addition of sculpting tools in 2016 makes light work of modelling tasks such as terrain generation

ABOVE Troublesome skinning problems that arise when animating have the potential to be fixed in mere minutes using the Delta Mush Deformer

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CPU 64-bit Intel or AMD multicore processor graphics hardware (parallel CPU and GPU usage to accelerate playback and manipulation of character rigs)

RAM 4GB (8GB recommended)

Disk space Minimum 4GB

Summary

- ★★★★☆ **Features**
- ★★★★☆ **Performance**
- ★★★★★ **Design**
- ★★★★☆ **Value for money**

Verdict ★★★★☆

Maya 2016 has a brand new look and the workflow improvements make this a valuable upgrade

3ds Max 2016

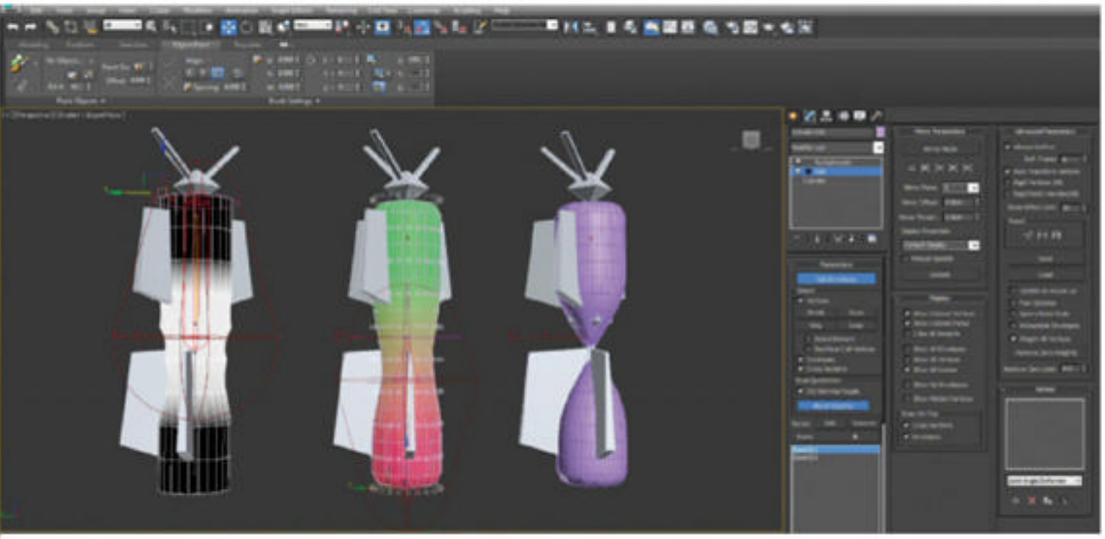
Autodesk's "Biggest Max Ever" brings forth Max Creation Graph, a new node-based creation tool

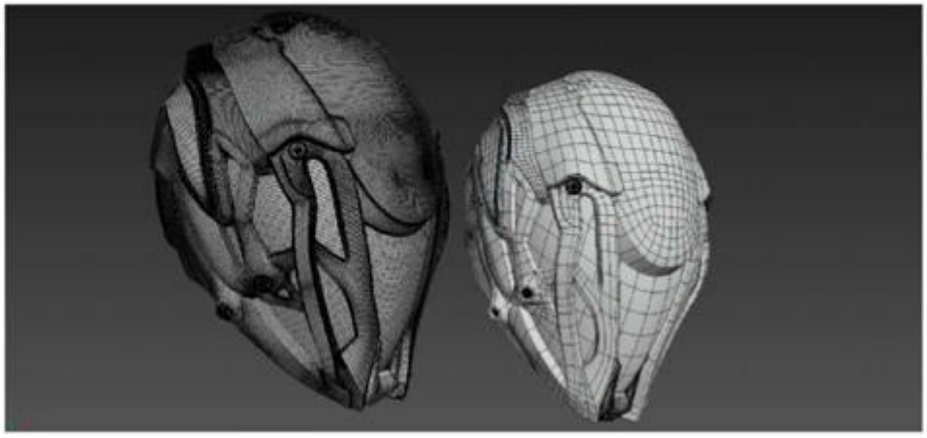
Over the years there have been upgrades in 3ds Max and usually these changes are small but nice tools. However, we now have a bunch of essential, new and updated tools for our 3ds Max arsenal, especially as 3ds Max 2016 now combines 3ds Max and 3ds Max Design together for one mega product release.

When you open up 3ds Max 2016, the interface looks almost the same apart from the Scene Explorer docked on the left that first came with the 2015 version. Scene Explorer is a rejuventated Layer Explorer, which, other than the Hierarchy view, also has the Layer View that can now have nested layers within layers. It's intuitive and you will get used to it in no time, plus you now have different workspace templates. Importantly though, in the latest release Autodesk has made some giant leaps for the industry – just the MCG (Max Creation Graph) alone is a game changer. It will no doubt help out the whole community in building procedural scripts and tools for 3ds Max.

The MCG is a node-based scripting tool, and you can wire parameter nodes and connect procedural tools and modifiers in minutes. They can then be saved as a MAX tool XML file and a MAXCOMPOUND – both can be easily shared with the community. What does this mean to the average user who doesn't know anything about scripting and building tools though? Even if you don't know the first thing about it you will have access to shared tools made by others to make your workflow better, faster and stronger! The great thing about it is that it's reuseable too! We downloaded this shared sample pack from Christopher Diggins: **area.autodesk.com/blogs/chris/max-creation-graph-mcg-sample-pack-for-3ds-max-2016** and checked out the AWeld.maxtool modifier inside. It works pretty simply – you have your operator WeldMesh, which in its description states that it "combines vertices that are closer than the given threshold", and in it you just need to connect up the mesh and the threshold to define the distance of the WeldMesh operation. Connect it to an output modifier and you get it in the modifier list ready to be piled up in the Modifier Stack. The end result is an artist-friendly scripting environment.

As for the modelling workflows, the OpenSubdiv modifier is definitely worth a mention; it came with Max 2015 but has now been upgraded. The new view-dependent, adaptive OpenSubdiv has a GPU display, better support and automatically reduces the number of subdivs shown according to the





> Max Creation Graph... will no doubt help out the whole community in building procedural scripts and tools for 3ds Max 2016

FAR LEFT This model and rig, which has been named Gsuit, was made to see how a rig acts with a high-poly model

LEFT On the left blend shape of the modifier, you paint a black and white image for the Dual Quaternion, and on the right is the mesh result when rotating the bone more than 360 degrees

ABOVE Gsuit's detailed chest piece and materials

MIDDLE LEFT In this image we presented how the MCG works by exposing the node base connections for the AWeld.maxtool

BOTTOM LEFT Here we can see the different subdivision modifiers and how they work to make the end result

distance of the mesh from the camera – improving on performance.

The OpenSubdiv modifier performs the subdivision and smoothing actions of mesh objects. It also reads crease settings from underlying stack entries and applies them to the modified object. In combination with the CreaseSet modifier you should be able to go through all the edges with ease as the CreaseSet modifier lets you make layers of different crease intensity to all of the crease edges.

Another new option is Dual Quaternion Skinning, which will avoid undesirable deformation and artifacts due to any folding of the mesh as this can cause the volume of the mesh to lose its shape. You can now paint the weights for the Dual Quaternion weight map (black and white), and paint tools can be used where necessary (most likely for a character's shoulders and wrists).

XRef has also gotten a lot improvements, and it now supports scenes with animation much better than before. You can edit materials and lights in a nondestructive way without changing anything in the master scene!

Meanwhile Iray has been greatly enhanced in Max 2016 – Iray Light Path Expressions, for example, can isolate lights and objects based on layer name for easy lighting control. Iray is now just a click away from the perfect render.

Darijan Kalauzović

Essential info

Price	£186 inc VAT / $185 per month, £1,488 inc VAT / $1,470 per year
Stand-alone Licence price	£3,100/$3,675
Website	autodesk.com
OS	Windows 7 (SP1), Windows 8 and Windows 8.1 Professional
CPU	64-bit Intel or AMD multicore processor
RAM	4GB (8GB recommended)
Disk space	6GB
Mouse	Three-button

Summary

Features ★★★★☆
Performance ★★★★½
Design ★★★★☆
Value for money ★★★★☆

Verdict ★★★★☆

One of the better releases of 3ds Max in quite a while, the Max Creation Graph is really going to make everyday tasks a lot easier

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Overclockers RENDA PW-E7F

This fast eight-core system from Overclockers is a perfect match for most rendering workloads

RENDA is a new workstation brand from UK component vendor Overclockers. It's one of the biggest retail rivals of Scan Computers, whose 3XS line of 3D systems has consistently impressed us, with some of the fastest workstations we've tested. A high standard for RENDA to meet, but from initial impressions, from the packaging to the build quality, the PW-E7F is a first step in the right direction.

The RENDA line-up consists of entry-level and mid-range workstations under £1,000, with Core i5 and i7 processors, all the way up to dual-processor builds. As with most vendors, there's a customisation page, with the full range of AMD FirePro and Nvidia Quadro graphics cards available.

The default configuration includes a Quadro K2000 (Quadro K620 in the less high-end models), 128GB SSD, and a 1TB hard disk.

The PW-E7F we received for review has a beefier specification though, with a FirePro W8100 video card and eight-core Intel Core i7-5960x CPU which has been overclocked to 4.3 GHz. There's a 256GB Samsung 850 Pro SSD and a 2TB Seagate hard disk here too.

With these components, the retail price comes to just over £4,000, although the graphics card alone accounts for a large chunk of this price, so if you opt for a slightly less high-end model, you can save some cash.

The specification very closely matches Scan's 3XS GW-HT20, which costs less in conparison, but Overclockers has managed a slightly higher clock speed, squeezed in a beefier power supply and included 32GB of RAM in the PW-E7F. Notably, there's a custom-built liquid cooling system instead of an all-in-one from the likes of Corsair.

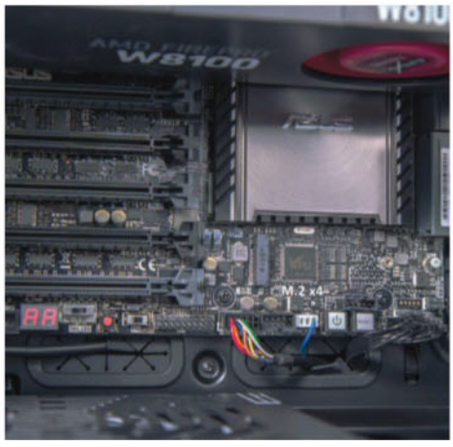
An overclocked Core i7-5960x is just about the best CPU you can get for general-purpose rendering, and that's because it offers eight cores to handle multithreaded rendering jobs, but with a high clock speed, it will chew through other tasks too. Intel's Xeon processors have their uses of course, and this is a chip we'd recommend above all others in the market.

The PW-E7F managed some great results, with a score of 191 in CINEBENCH OpenGL and 1717 in

RIGHT The build quality is superb, with great attention paid to the cable management

ABOVE Although it's not exactly cheap, the high-end hardware makes the PW-E7F good value for money

RIGHT Phanteks' stylish yet simple cases maximise cooling potential and are used for all water-cooled RENDA workstations



ABOVE The Nvidia Quadro K5200 in the ThinkStation can be added to the PW-E7F for empowered performance

ABOVE The custom-built liquid cooling system looks fantastic and is very powerful

the CPU test. A score of 64.96 in SPECviewperf's catia-04 test is identical to Scan's machine while the 1196 LuxMark OpenCL result is just a bit higher, and this of course reflects the small processor clock speed difference.

In 3ds Max the Underwater test was completed in 1 minute 50 seconds at VGA resolution and 6 minutes 46 seconds at 1080p. Xeon processors normally storm ahead in this test, but while the PW-E7F was outgunned by workstations like Lenovo's P900, with dozens of CPU cores, it's still a great result to be had.

Generally then, this is a perfect configuration and specification for most people, and will therefore satisfy the needs of most artists.

Orestis Bastounis

> "Overclockers has managed a higher clock speed, squeezed in a beefier power supply and included 32GB of RAM"

Essential info

Price	£4,114 inc VAT
Website	overclockers.co.uk/LP/renda.php
CPU	Core i7-5960x overclocked to 4.3 GHz
RAM	32GB DDR4
GPU	AMD FirePro W8100
SSD	Samsung 850 Pro
Storage	Seagate 2TB hard disk
Cooling system	EK water blocks and radiator

Summary

★★★★★ **Features**
★★★★★ **Performance**
★★★★★ **Design**
★★★★☆ **Value for money**

Verdict ★★★★★

Well built, superb performance and great for 3D. Overclockers knows what it's doing

ABOVE The new Tri-planer node enables seamless texture wrapping for any bitmap on your chosen mesh

Substance Designer 5

Is the latest iteration of the node-based procedural texture generation software worth the upgrade?

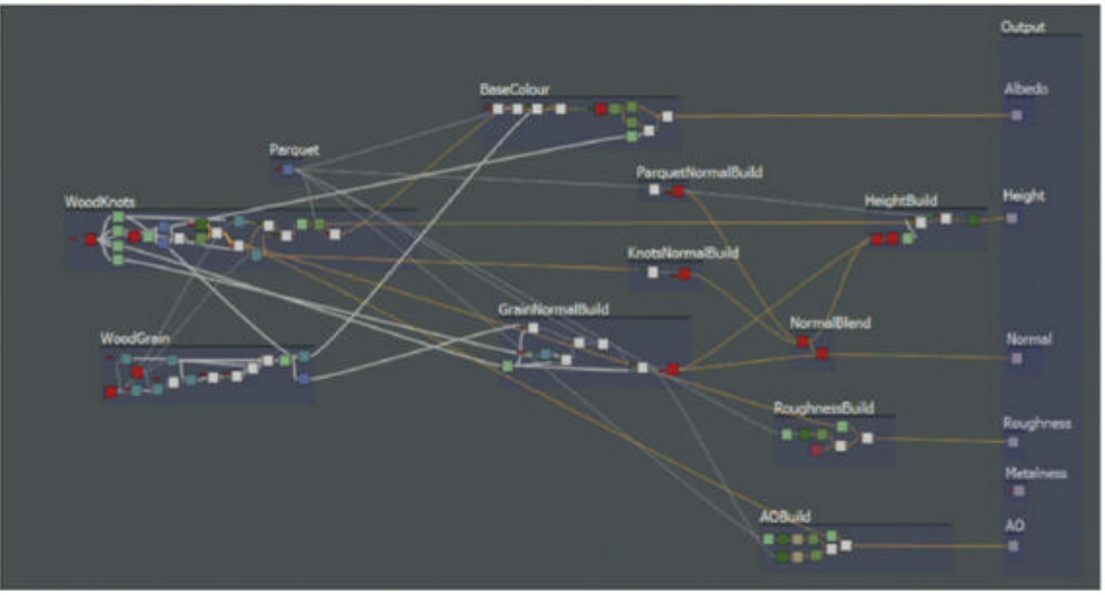
Substance Designer 5 has been released to quite a fanfare. Allegorithmic declared that this was the #yearofPBR back in January and backed that up with some excellent physically based rendering guides and updates to sister package Substance Painter. We were eager to see what had become of the package that introduced us to Allegorithmics texturing philosophy.

For those unfamiliar with Designer it uses a node-based system, compiling the texture through various inputs and functions in the form of graphs which output all common real-time maps for both a metallic or roughness one and a specular or gloss workflow. Outputs can be customised to combine maps into RGBA channels too, depending on what your target renderer requires. Alternatively several game engines now have Substance support, enabling you to output your graphs directly to the engine, and this opens up the possibility of exposing parameters within the graph that can be changed or adjusted in engine, from simple effects such as colour changes, through to complicated wear-and-dirt compositions.

SD5 is more a refinement than a game changer. There are some new nodes available, such as Tri-planar mapping, which should see an end to seams in imported grunge maps, and the pixel processor, which will enable the more technically inclined artist to create per pixel functions. The early iterations of PBR-specific nodes, available in the later Substance Designer 4 updates, have made a more polished appearance in this release. Additionally the blend node now has several extra Photoshop-familiar blend modes included with it.

We took a simple character clothing asset through the Substance workflow, utilising its built-in baker. The software can generate the full spectrum of real-time maps, from Normal and AO, (either from mesh or GPU-based) through to the less commonly used position (world space gradient) and thickness maps. This really is an excellent feature and great for revisions, or if additional maps are needed for the various procedural wear-and-dirt generators that Substance comes with.

The baker itself is both fast and accurate using either distance-based ray cast or cage baking. It didn't however warn us of a broken cage in the way



> There are some new nodes available, such as Tri-planar mapping, which should see an end to seams in imported grunge maps

TOP LEFT Some graphs can become complex, but SD's clean UI keeps everything understandable

BOTTOM LEFT With a few hours spent going through tutorials you can achieve some excellent engine ready procedural textures for your projects

BELOW A basic jacket asset baked and textured inside Substance. We were impressed with the baking options

that XNormal would, but that's the only fault we could find with it and this was soon fixed once we viewed the Normal map generated in Substance's own 2D map viewer.

When using the procedural wear nodes it took quite a bit of slider exploration to get a result that we were happy with, sticking with very low values. For a simple test we were pleasantly surprised by the out-of-the-box options, but they do feel a little hit and miss at the moment, and are probably more suited to hard surface objects than organic pieces such as characters. We tried exporting our resultant graph out to Substance Painter, hoping that it would keep the graph structure so that we could detail the texture. Unfortunately it exports the graph as a flattened image, something that we hope Allegorithmic can address in the future.

Aside from texturing standalone meshes, the other string to Substance Designer's bow lies in the creation of procedural tiling materials.

These are created through the use of generators (greyscale patterns essentially) and functions, the latter of which contain everything from tiling and offset nodes through to common blending modes, and transform options. With this in mind we thought that we would try our hand at a procedural wood texture. The learning curve for this becomes quite steep, there are rollover tooltips that provide a brief outline of a node's uses, but we did find ourselves referring to the internet as Allegorithmic and various YouTube users have graciously uploaded tutorials which explain uses in a little more depth and show the possibilities available.

The new Dynamic gradient node was particularly useful, as it enables you to create a line across any image which maps the RGB value underneath to a gradient with adjustable precision. It gave us some great tonal variation, perfect for the woodgrain that we wanted to achieve.

Seth Nash

Essential info

Price	£109.99 (indie) inc VAT, £449.99 (pro) inc VAT / $149 (indie), $590 (pro)
Website	allegorithmic.com
OS	Windows 7 / Mac OS X 10.8 and up
RAM	4GB recommended
Free space	1GB recommended
Processor	X86 with SSE2 recommended
Graphics (Windows)	Minimum DX10 capable

Summary

Features
Performance
Design
Value for money

Verdict

Once you have the basics down, it becomes a powerful texture generation tool

ABOVE The animation interface and timeline are uncomplicated and easy to work with. Alternatively, you can apply premade animations

BELOW iClone 6 comes with a library of premade objects, animations, sounds, and even shaders. If you find it lacking, you can download more content online

iClone 6

Bypass object creation and rigging, and get straight into the animation process with the latest Reallusion tool

Returning with a significant upgrade to its 3D animation production tool, Reallusion's iClone 6 has been almost completely revamped to offer its users the most streamlined iClone experience yet.

What iClone 6 lacks in object modelling tools it makes up for with a considerable amount of embedded content, now boasting improved functional and visual quality since the upgrade. Playing around with these prepacked objects is a great way for newcomers to get used to the program. Setting up a scene using the preset 3D 'stages' and 'actors' in iClone 6 can feel a little like putting together a house in *The Sims*, but the potential for producing high-quality work with little time and effort is immediately apparent.

Everything about iClone 6 is built for making work of high quality in as little time as possible. It has reduced many of the more complicated procedures required for sliders or simple button clicks, and shader set-up is now even faster than it ever has been before.

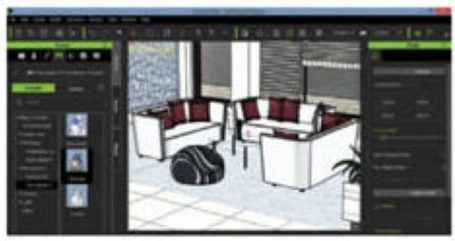
iClone will autoconvert all imported real-time materials and lighting data into a physically based format compatible with ray tracing capabilities. Furthermore, if you're not satisfied with the visual quality of your object, surface smoothing can be applied to increase the surface detail of low-poly models with the click of a single button. It includes support for industry standard technologies, such as the updated Unreal Engine, as well as Indigo RT, which enables users to work in hi-res cinematic quality in real-time – very handy for increasing production speed.

iClone 6 fully supports importing objects from programs such as ZBrush and Maya; combine this with Indigo RT to work with your objects in full cinematic quality without the need to prerender. A veritable arsenal of tools are available for iClone 6: SpeedTree, Softcloth, DirectX 11's Tessellation, a mo-cap plugin – the list goes on!

Its applications are vast and varied: pre-vis, game asset creation, TV production; meaning boundless potential for creating full scenes from separate imported objects, which could then be exported to Photoshop and used as drawing reference.

iClone 6's simplification of functions is exactly what makes it so accessible to 3D newcomers, and so useful for experienced users. It's not a replacement for more sophisticated animation tools like Maya, but users interested in producing high-quality animation without the need to create content from scratch will get a lot out of iClone 6.

Rebekka Hearl



Essential info

Price	$99 Standard / $199 Pro
Website	reallusion.com
OS	Windows only
CPU	Dual core CPU or higher
RAM	4GB
HDD space	5GB
Display	1024 x 768
GPU	Nvidia GeForce GTX 400 Series / AMD Radeon HD 5000 Series

Summary

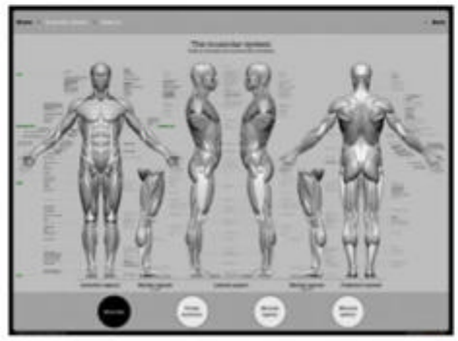
★★★★☆ **Features**
★★★★★ **Performance**
★★★★☆ **Design**
★★★★☆ **Value for money**

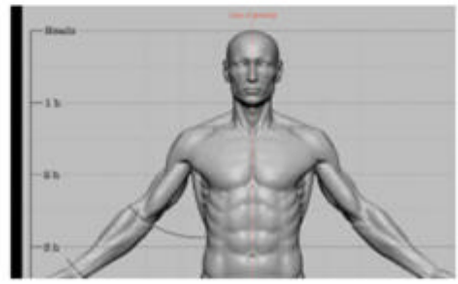
Verdict ★★★★☆

Streamlined and uncomplicated, iClone 6 is a great animation tool for beginners and advanced users alike

Écorché Assistant

If you're interested in human anatomy for modelling or animation, this is the app for you





ABOVE Écorché assistant includes a full overview of the male proportions including skeletal and muscular system. Each muscle is shown in detail including origin, insertion and action

RIGHT Muscle layers are also shown in order for when designing écorché in clay

Already talked of as being better than a pile of anatomy books, Écorché Assistant is certainly an app on human anatomy that has gotten the industry's attention. Even legend Rick Baker has described it as the most thorough app he's ever seen. This comes as no surprise as the creator behind Écorché assistant, Alexander Kafoussias, is a graduate of the sculpture program at the Florence Academy of Art.

Though currently only for male anatomy, the app goes into an astounding level of detail in a clearly organised visual way. On the main homescreen, you can choose between a model showcasing the muscular system, one showing the skeletal system, and a representation of the body's proportions to delve further – even giving you the ability to rotate the models with your finger to be able to see (and replicate) the muscles and skeleton from every angle. The only pity is the fact that you can't close up on these rotatable models to be able to look at details when you're sculpting anatomy in 3D, for example, though it's an option that we imagine will be added in later versions.

Once a model is selected, you'll be able to see details of the human skeleton and muscle structure at an almost medical level, with every muscle named, cross-sections of the body shown close up, and even the ability to see muscle actions and what bones and muscles are responsible for different movements. This would not just be excellent for anyone hoping to become a great 3D modeller, but for animators as well.

Larissa Mori

Essential info

Price	£10.99 / $14.99
Website	ecorchebyalexander.com
OS	iOS 6.0 and up. Compatible with iPad
Version	1.2
Size	684MB
Language	English

Summary

★★★★★ **Features**
★★★★★ **Performance**
★★★★☆ **Design**
★★★★☆ **Value for money**

Verdict ★★★★★

We can see why so many in the industry are giving this anatomy app a lot of attention!

Figuromo

Collect and modify the world's best 3D models as digital figurines with the new app collection

MAIN Change the colour and material settings of your model from an impressive palette

LEFT Figuromo apps are inspired by the collectable figurine market

Inspired by the collectible figurine market, Figuromo Studio LLC has created a whole new way to display high-end 3D sculpture on an iPhone or iPad after working with famous CG artists around the world in a 50 per cent profit sharing agreement. The ultimate result is a series of apps that let you actually modify incredible industry 3D character models on Figuromo for £0.59 on Android and £0.79 on Apple devices.

If you'd like to take a closer look at our former cover artist Aldo Vicente's Caballero Royal piece from issue 68, for example, all you need to do is download his Figuromo Castle Gatekeeper Knight app. From there, you can choose from four different views of the posed model to then see it close up in a very user-friendly UI menu. Here, you can rotate the model, though not by a full 180 degrees, and individually select areas such as the feet, head and accessories to then modify materials and textures with a variety of options.

Despite the lack of support for the iPad's touch functions to be able to zoom in on the model easily with our fingers, within minutes we had easily created our very own version of Aldo's piece and had a lot of fun changing the colour from an impressive palette of light and dark tones, as well as the finish from matte to more shiny on many different parts of the knight before saving our creation. This is an excellent way to introduce younger children to the idea of 3D artwork – something Figuromo Studio LLC has certainly acknowledged with the release of the Figuromo Kids apps, specifically catered towards them.

Larissa Mori

Essential info

Price	£0.79/$0.99 per app on iTunes / from £0.59/$0.99 in Google Play
Website	figuromo.com
OS	Android OS 3.2 / iOS 6.0 and up (optimised for iPhone 5, iPhone 6, and iPhone 6 Plus)
RAM	512MB
Size	From 32MB for Android / from 45.2MB for iOS

Summary

★★★☆☆ **Features**
★★★★★ **Performance**
★★★★☆ **Design**
★★★★☆ **Value for money**

Verdict ★★★★☆

A great introduction to 3D art for kids – and a great way to collect some of the best 3D models as digital figurines for adults

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The Hub

The inside guide to industry news, VFX studios, expert opinions and the 3D community

> Our target was to try to get it three times faster so something that would have played at ten frames per second would now be playing at 30

Warren Trezevant, product manager for Maya animation and rigging at Autodesk

088 Community news

3D model cars

Delve inside the world of perfectly replicated 3D printed model cars with Bill Gould and Brian Yingling – they can cost up to $40,000 each!

090 Industry news

Autodesk v2016

The new Maya and Max 2016 are released by Autodesk, while The Foundry unveils MODO 901 and a totally free, unwatermarked version of NUKE to play with

092 Industry insider

David Helgason

The cofounder of Unity Technologies talks us through the democratisation of game development in the industry

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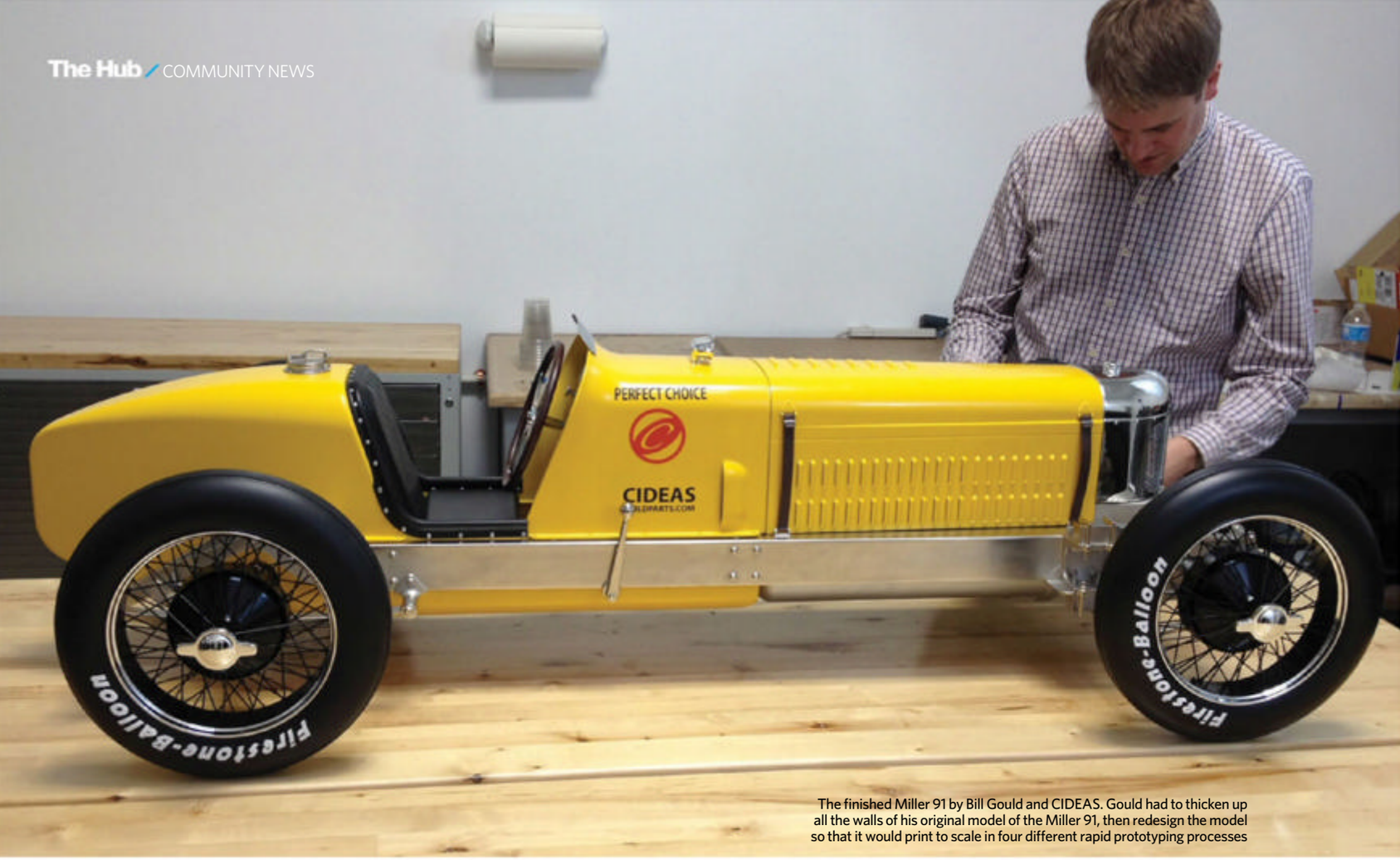


The finished Miller 91 by Bill Gould and CIDEAS. Gould had to thicken up all the walls of his original model of the Miller 91, then redesign the model so that it would print to scale in four different rapid prototyping processes

3D printing $40,000 model cars

Designers Bill Gould and Brian Yingling tells us how 3D printing has revolutionised perfect miniatures

Bill Gould has been in business for 42 years as a model maker, "I started when I was 12-years-old," he begins. But Bill got sidetracked after high school, initially getting into set design before working so much he burnt out and left the industry completely – only to start working on modelmaking once again. A few years later, Gould had opened his very own business.

Incredible opportunities began to become a reality, like getting to work with the great Henry Dreyfuss: considered by many to be the father of industrial design. "Dreyfuss did all of the big stuff," Gould remembers. "He designed the standard domestic telephone, designed the Polaroid cameras, you name it, and I was very fortunate to work with him."

In the year 2000, however, things changed in a way Gould could have never predicted. "Rapid prototyping really started up and literally within six months my model-making business just went through the floor," he reveals. "I was absolutely slamming to keep my business going because the problem was I could do a model and it might take three or four weeks and cost say $2,000 (£1,338) at that time in those dollars, but with rapid prototyping they could get the same thing done in three days for $500 (£334).

"I talked to my clients and they all agreed that I should get into SOLIDWORKS, get into CAD. So I went to college at night for two semesters, I took SOLIDWORKS beginning and advanced classes. I sold my drafting table machine and sold all my machinery. I'm now strictly a designer, and it's proven to be a very good choice."

For Brian Yingling, who first started creating his own miniature museum-quality car models over 20 years ago, adapting to additive manufacturing and 3D printing was also a part of keeping his business going. "It's really been kind of three major transitions," he tells, "one was just to do it all by hand, the second one was creating 2D drawings with AutoCAD and being able to take advantage of the CNC machines to bring them into reality, and the third step which is where I am now is actually drawing the entire car in 3D software and then sending that to a 3D printer."

The process begins with research for blueprints and information on how the vehicle was built: crucial for producing the level of detail needed in Gould and Yingling's final creations, which will even have miniature leather seats for the visual accuracy required. Next comes the modelling.

"I use 3ds Max to create my models," says Yingling. "You have to remember that the parts definitely have to fit together like a puzzle, there's no question. The more accurate you are in your 3D the easier it will be for assembly later. You need to think about the tolerances of how things fit together – or else you'll be doing a lot of hand work like sanding it or filing it to make it fit the way it's supposed to fit."

ABOVE The Cadillac was developed over the course of eight months, and created with the use of over 95 per cent 3D printed parts

> "I could sometimes print the entire car body in one print with CIDEAS as opposed to printing it in pieces"
>
> **Brian Yingling, hand-built model car specialist, product designer and computer artist**

ABOVE Yingling with his newly finished Ford Mystere. Every detail – including the upholstered seats – can be seen in the model cars

RIGHT Work in progress on Gould's 1927 Miller 91 model car. It was created using all four major 3D printing processes in just six weeks

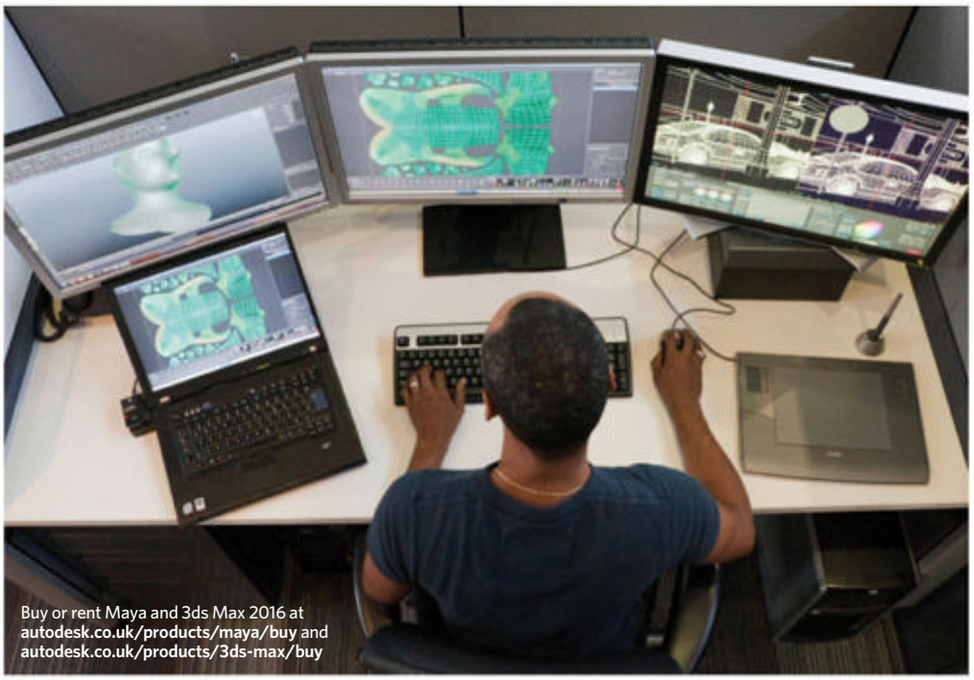
BELOW Yingling's Scale Buick show car that is a sixth of the scale. It is in the process of being built using 3D printed parts with CIDEAS

"You even have to build in allowances for paint thicknesses and allowances for plating, you kind have have to know the accuracy of SLS vs SLA and you have to build those in," explains Gould. "I always make sure I do my designs in a way that I could always come back and modify the wall thicknesses easily, for example – that's one of the most important things to make pieces strong enough."

For both the designers, collaborating with Additive Manufacturing and 3D printing centre CIDEAS has become the way they bring their 3D printed designs to life. "They are one of the few companies around that has the ability to print very large pieces," says Yingling. "I could sometimes print the entire car body in one print with CIDEAS as opposed to printing it in pieces and having to make it like a puzzle to put together later." The collaboration led to the two projects Gould and Yingling are most proud of ever having created: a Miller 91 miniature and a scale Cadillac with 95 per cent of its parts 3D printed.

After printing, parts like the bumpers and door handles will be sent out to a chroming shop to be chromed while elements like the hub caps of the wheels will be sent out to another company that does brass casting. "That's usually what takes the longest amount of time," Yingling continues. "It's typical – the chrome shop takes six to eight weeks before you actually get some parts back. But there are many things that can be done while you're waiting for that, like finishing the body work and paint, and upholstering the seats." Ultimately, the final miniatures created can cost anywhere from $3,000 (£2,009) up to $40,000 (£26,795).

For anyone interested in following in their footsteps for the future, Gould has one important lesson to remember: one he learned from his time working with Dreyfuss in the early Seventies, before the great designer committed suicide. "That's a long story and it's a sad story," he concludes, "but I'll always remember at a conference for one of our huge clients he made the most amazing comment: he said 'To design for the future, we must understand our past', and I thought, 'He's absolutely right.'"



Buy or rent Maya and 3ds Max 2016 at **autodesk.co.uk/products/maya/buy** and **autodesk.co.uk/products/3ds-max/buy**

Maya and 3ds Max 2016 released

New features include a sculpting toolset from Mudbox, a Max Creation Graph and more!

Now available to buy as a perpetual licence as well as rental for the very last time, Autodesk has unveiled the brand new Maya and Max 2016 – two updates with a host of exciting features.

Faster animation: how it works

Warren Trezevant, product manager for Maya animation and rigging says: "One of our biggest challenges is clearly understanding what our customers need and making sure we deliver the value they want that will get their work done more easily, intuitively and faster."

"The parallel rig evaluation [and] the multithreading of Maya, was a huge improvement... We're also providing a profiler, which will allow our users to see how Maya is evaluating their scene, and make tweaks to make Maya even faster. Our target was to try to get it three times faster so something that would have played at ten frames per second would now be playing at 30."

For Maya, users will get huge improvements in animation performance due to a new parallel evaluation system that takes advantage of both the CPU and the GPU, ultimately increasing the speed of both playback and character rig manipulation. Modellers will also see a change: the Autodesk team has now partially integrated Mudbox tools and capabilities straight into Maya with a brand new sculpting toolset. This will include brushes that feature volume and surface falloff, stamp images, sculpting UVs and support for Vector Displacement maps.

Meanwhile, 3ds Max users will be able to get their hands on what Autodesk is calling "The Biggest Max Ever" with 3ds Max 2016. Two different products, 3ds Max and 3ds Max Design, are now merging into one single 3ds Max that can be much more tailored to an individual's needs. The new Max Creation Graph is another impressive feature. Integrated by user request, it's a node-based tool creation environment that enables anyone to extend Max's capabilities by creating new tools and visual effects through the connection of several hundred different node types. We can't wait to see what people create!

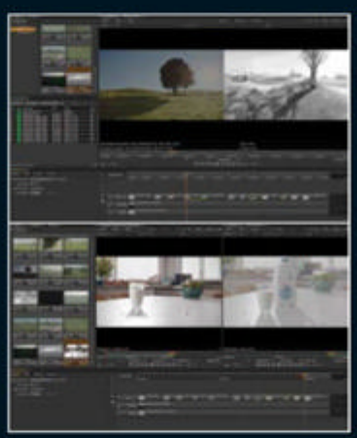
A gift for compositors

The Foundry introduces MODO 901 and a brand new free version of NUKE

It's certainly been a very exciting time for The Foundry so far this year. Over the space of just a few weeks, the company announced both an exciting new MODO 901 and NUKE Non-commercial, a totally free, nonwatermarked version of the entire NUKE product family, with some light functional restrictions, for anyone who wants to learn the professional compositing solution without having to pay in the thousands.

"We're committed to investing in the future of VFX and the talented artists who continue to astound us with the content and experiences they create," said Philippa Carroll, head of media production, business strategy and operations. "By opening the whole NUKE range to the widest audience, people interested in personal learning and projects, experimentation or research can use the same solutions used by some of the most talented VFX artists across the globe."

Learn more about the new NUKE Non-commercial at **thefoundry.co.uk/products/nuke/non-commercial**, and see all of MODO 901's features at **thefoundry.co.uk/products/modo/latest-version**.



Explore the tool that the best VFX artists use to composite, edit and finish using The Foundry's new NUKE Non-commercial release

HAVE YOU HEARD? Luxion has announced the building of new corporate headquarters due to continued growth of the company

ZBrush Summit 2015

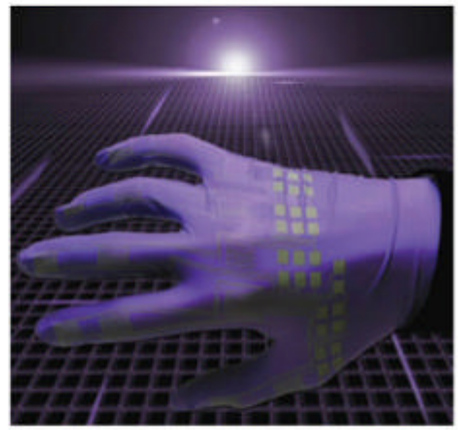
Pixologic has unveiled the official dates and details of this year's official ZBrush event

After a very successful ZBrush Summit last year, which gave artists a specially created free event aimed at users of the digital sculpting package for the very first time, Pixologic has just revealed that they are now all set to reveal details of the ZBrush Summit 2015 via a blog post.

The event, which will take place from the 25-27 September this year, will once again be held on the grounds of LA's prestigious Gnomon School of Visual Effects for what Pixologic is calling the ultimate ZBrush experience. Attendees will be treated to a variety of dynamic presentations and panel discussions over the three days, including on-site workshops, a live ZBrush Sculpt-Off Championship amongst some of the best digital sculptors today, and the first ever ZBrush Awards.

ZBrush Summit 2015 will also be streamed live – with exclusive competitions that can be entered no matter if you are watching in LA or at home.

Register your interest to stay in the loop with upcoming announcements at **summit.pixologic.com**



An artistic render of how soft, flexible circuits and electronic devices could be printed to provide stretchable garments that let us interact with computers

RFCORE for Cinema4D

Next Limit announces the latest edition to its award-winning RealFlow portfolio

In an exciting move for Cinema 4D users everywhere, Next Limit has announced RFCORE for Cinema 4D, giving all users the ability to access the industry standard fluid simulation software, RealFlow, right from inside of Cinema 4D itself, without the need of learning a new interface or having to move files between software applications.

"We are very excited about RFCORE|C4D," said RealFlow Product Manager, Gustavo Sanchez. "We work a lot with the C4D community and understand that, for some artists, RealFlow might seem a little daunting. Therefore we are pleased to present them with a solution which will allow them to access high-quality RealFlow fluid simulations from inside their 3D package."

The team have also mentioned that this upcoming release of RFCORE will open up the possibility for other RealFlow integrations, making the fluid simulation software accessible to many more artists for the future.

Though the exact release date hasn't yet been announced for the new RealFlow integration, Next Limit have said that RFCORE|C4D is scheduled to be out later this year

Liquid metal could change 3D printed robots

New research shows how printing technology could produce soft robots and flexible electronics

Soon 3D printing with liquid metal might very well be possible, according to research from Purdue University, Indiana.

Because liquid metal in its native form is not print-friendly, liquid metal nanoparticles are created by dispersing the liquid metal in a nonmetallic solvent using ultrasound. This process makes them small enough to pass through a typical inkjet printer nozzle sucessfully.

According to the researchers, the tech could help introduce a whole new class of pliable robots, enabling these robots to squeeze through small spaces, for example.

Liquid metal printing could also lead to the mass production of stretchable garments that people would wear so that they can physically interact with computers for the first time.

Software shorts

Bringing you the lowdown on product updates and launches

Fusion 8 and Fusion 8 Studio for Mac and Linux

Blackmagic Design has announced that Fusion 8, its advanced visual effects and motion graphics software, will be released on Mac OS X and Linux for the very first time. Fusion 8 will be available free of charge from the Blackmagic Design website, while Fusion 8 Studio will be available for $995 (£655.55).

Shotgun 6

Shotgun Software has unveiled the new Shotgun 6, which features new project templates, enhanced navigation and browsing, improved Flame integration, and the ability to work together with RV 6 without any required end-user configuration. You can download the software from $30 (£20) per account, per month.

Isotropix Clarisse iFX 2.0

After first being announced in August last year, Isotropix is now shipping Clarisse iFX 2.0, its next-gen 2D/3D rendering tool, which is the fusion of an animation package, compositing software, and 3D rendering engine. Prices start from $999 (€849) per licence for freelance artists and $1,499 (€1,299) for a licence for a small studio with up to five artists.

DID YOU KNOW? Pacific Rim 2 has been announced, and Guillermo del Toro is returning to direct the action-packed sequel

Job Co-founder of Unity Technologies

Website unity3d.com

Location Copenhagen

Biography David's background is as a programmer. Along with co-founders, Nicholas Francis and Joachim Ante David, he went on to found Unity Technologies, and then served as its CEO for 12 years. He now combines his understanding of technology and business to figure out how to create enduring businesses around great technology and teams.

Portfolio Highlights
2014-present *Realm*
2012-present *QuizUp*
2003-present *Unity*

David Helgason

Co-founder of Unity Technologies

We talk to the game engine mastermind about game development and democratisation

Unity was born 11 years ago – a game development engine with hopes to turn every bedroom coder into a fully fledged developer. Now, its fifth iteration has been released, bringing with it a whole raft of new features that will enable even more game creators to bring their ideas to life. We met with David Helgason, one of the original founders of Unity, to find out just how the system has gotten to where it is today.

What kind of work were you doing prior to Unity?
Before Unity I started a few companies, but none of them ended up taking flight or even really mattering.

Can you tell us how Unity as a concept came about? What experiences led you to the thinking behind Unity?
Unity (the company) was formed by the three of us founders coming together to make games. We first worked on an engine for our own use, but over a couple of years we decided that we were really more passionate about the technology.

Unity (the software) really came about to solve the problem that Unity as a concept didn't exist yet. There was no readily available software we could use. The software that already existed was too expensive and too unwieldy for a small team.

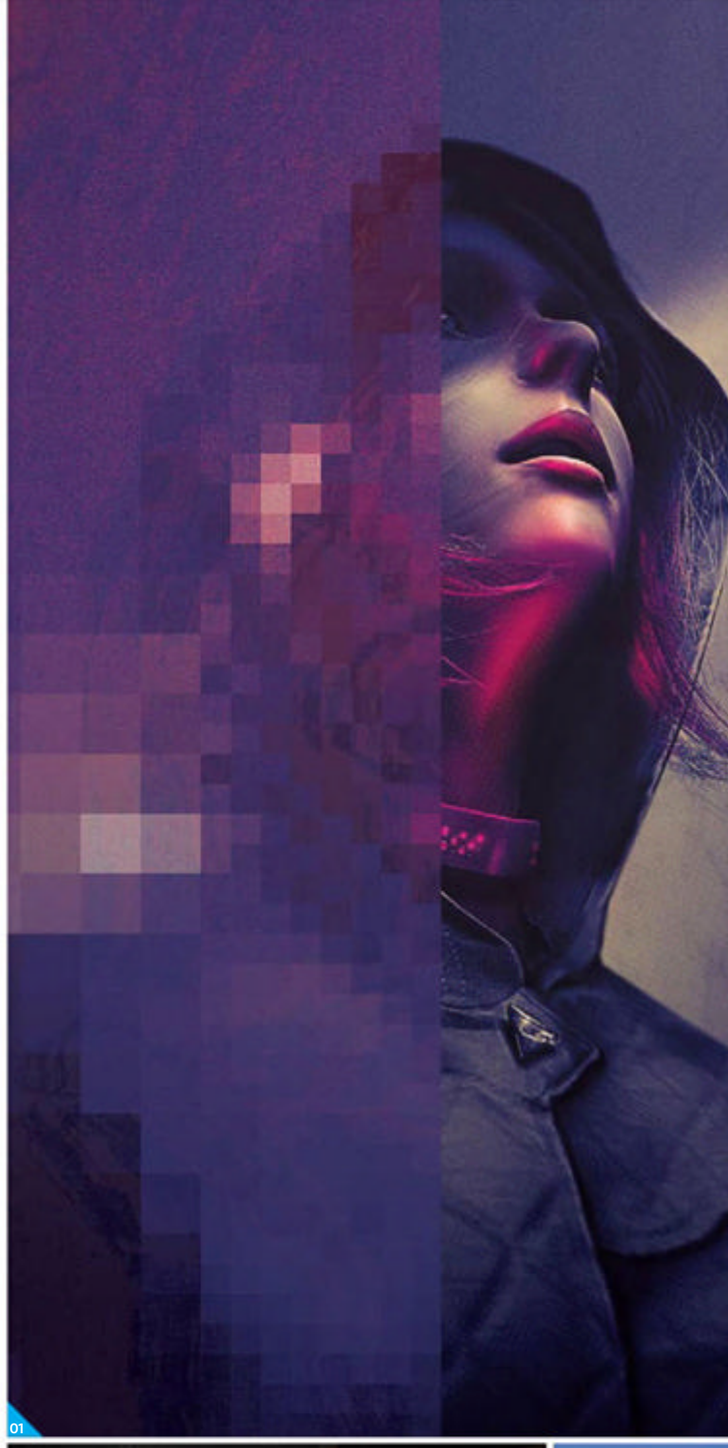
Even before Unity was a 'thing', we had a sense that we were onto something. We looked at the history of other creative mediums, and noticed that easier and more efficient tools had helped revolutionise both the film (digital cameras and editing) and earlier music (the home studio) industries.

So, based on that, our elected mission became to 'democratise game development'. What we took that to mean was to provide better, easier and cheaper tools, and thus make more people able to participate in game creation than before.

How different is Unity today to the vision that you first had? Has it changed in ways that you weren't expecting?
Unity's insanely better than in those old days, but overall it's the same thing: a great tool that makes game development that much easier and better. And the goals of the company remain the same: to make the game industry bigger and better and to make more developers successful than ever before. This includes massive upgrades to the graphics and performance in Unity 5.0 (and more updates in the next point releases).

Are there any elements you want to add to the engine that you have not yet had the opportunity to work on?
We have been working on making Unity even better for artists and designers. In Unity 5.0 we made the lighting and shaders so that it's really easy to get your art to look fantastic.

What excites you most about the independent gaming scene? What games have really impressed you?
I love the richness and the creativity of independent gaming. *Ori And The Blind Forest*, *Kentucky Route Zero*, and *Cities: Skylines* are all proof that tiny teams can make big things happen!



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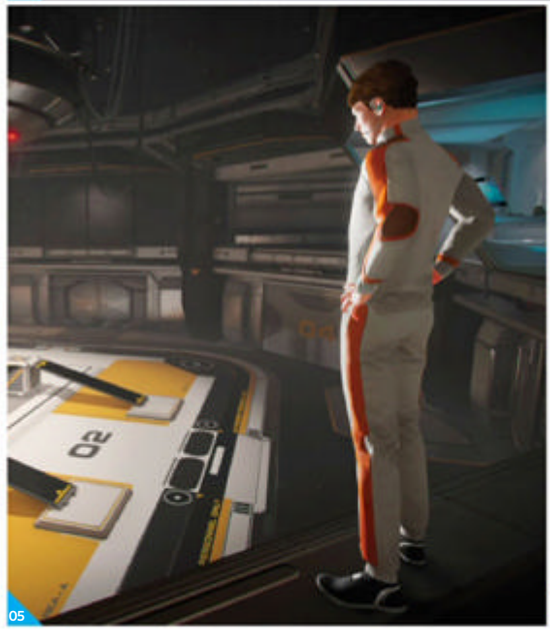

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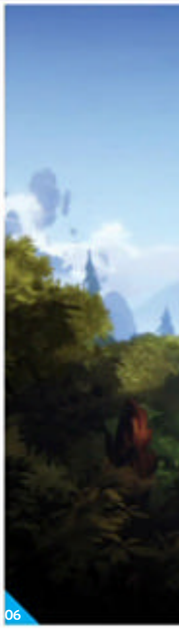

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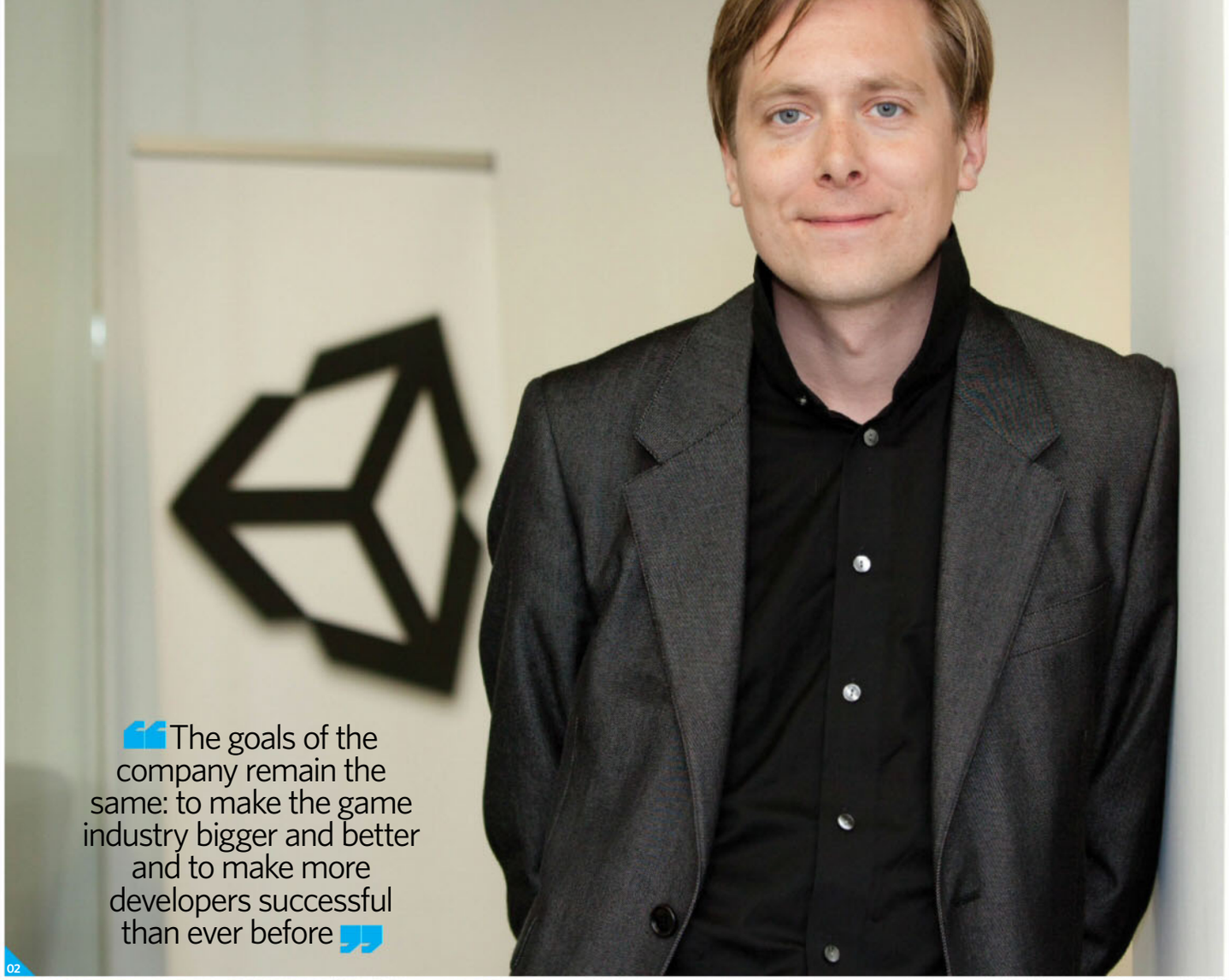

> The goals of the company remain the same: to make the game industry bigger and better and to make more developers successful than ever before

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Levelling the playing field

Helgason discusses the expansion of the ever-growing games industry

"There's no slowdown [for the games industry] in sight. The universe of people who play games is only growing, and both PC and mobile games are growing by leaps and bounds.

"Unity is getting better all the time, and with our free Personal Edition (which you can make money with) even more creative people can get started than ever before. The future looks bright for those who love games."

01 Unity came at just the right time: just as smaller, more casual smartphone games were coming to prominence. These apps started a golden age of independent game development, and Unity was there to ride the wave

02 Helgason was CEO of Unity Technologies until 2014, at which point he stepped down, with Electronic Arts' former CEO John Riccitiello replacing him. Helgason has remained at the company as executive vice president

03 Although Unity has grown more powerful over the years, Helgason says that the core ethos behind the software hasn't changed: giving more people the power to become successful game developer

04 Unity was founded by Helgason (far left), Nicholas Francis (far right) and Joachim Ante (second to left). They were hoping to create an easy-to-use and affordable game development tool

05 The recent release of Unity 5.0 has introduced many powerful new features, such as a physically based shader, real-time global illumination, HDR reflection probes and PhysX 3.3

06 Unity has been used to create a huge amount of incredibly successful games. Some recent examples include *Ori And The Blind Forest*, *Alto's Adventure* and *Monument Valley*

01

Images of the month

These are the 3D projects that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

01 We Are Back
by Paul Flower
3DA username ouroboros888
Paul says: "I was inspired by Scuderia Ferrari's winning return and Sebastian Vettel's first win for the team. My aim is to portray a balance between detail and movement in this 3D scene."
We say: *It was great to see Ferrari return to its winning ways in Malaysia, and Paul has captured the moment that Sebastian Vettel crossed the line perfectly. The reflections are superb.*

02 Img-5
by Krit Suppaudom
3DA username Maipai Suppaudom
Kritt says: "This work was created in ZBrush, KeyShot and Photoshop. I really enjoyed working on this character and found it extremely interesting to create the textures. I was very satisfied with this robot."
We say: *It's plain to see how much attention Krit has paid to texturing his droid – it has a real worn-out, abandoned look to it.*

03 Loft IT office interior design
by Dimitar Ivanov Gongalov
3DA username dg_architect
Dimitar says: "The set of images that this particular image is from are part of visualisations generated to present an office furniture company's products."
We say: *We're suckers for great interior arch-vis. We really like how crisp and clean everything is and it has been brilliantly lit as well.*

04 Abandoned Mercedes
by Rory Björkman
3DA username Rory Björkman
Rory says: "I'm interested in the textures formed by decay over time. In this image I've decided to render an abandoned Mercedes. I like to think it was once somebody's pride and joy."
We say: *There's a palpable authenticity about Rory's image – it could be a photo of an abandoned car in a postapocalyptic war zone.*

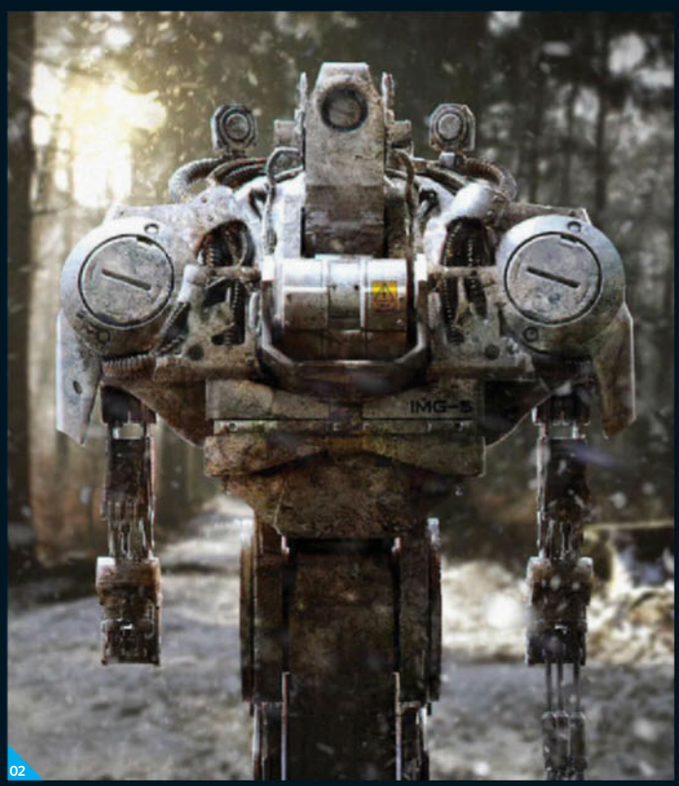

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Image of the month

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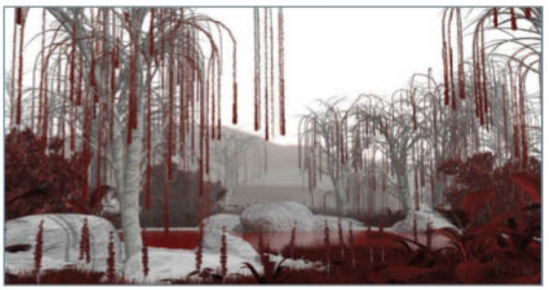

Bloodshot **by Brandon Kynoch**

3DA username Brandon Kynoch

Brandon says: "A small photorealism/nature project that I started so that I could really test my skills with Blender and Photoshop. I've really enjoyed working on it and it's come a long way from concept to final image."

We say: *Brandon is only 13 and has only been using 3D software for a little while. We love the detailed foliage and can't wait to see how Brandon's skills develop!*

Paul **by Daniele Boldi Cotti**

3DA username dboldicotti

Daniele says: "The inspiration came after a trip to the French Riviera. The main idea was to use a Pixar style, mixing different software – 3ds Max, Marvelous Designer, Dreamscape, Mudbox, Vue, V-Ray and Nuke – to get the best result."

We say: *This is a great scene that has been beautifully framed. Daniele has done a great job of creating believable water, while creating an abstract, cartoon scene.*

Alley at noon **by Syed Vaseem Haider**

3DA username Arshi

Syed says: "I was always mesmerised by this alley, where the sunlight on the rough surface reflects and makes everything look very beautiful."

We say: *Syed has succeeded in creating a fantastic rustic atmosphere and has used texture to great effect. We could easily imagine strolling down this alley.*

Mazda CX5 Interior **by Johnny Grilo**

3DA username square01

Johny says: "At my company I work a lot with car commercials, and creating interior views are always welcome – they're full of details and it's fun to watch light interact. Using V-Ray I could render accurately without spending too much time on shaders and tweaking."

We say: *We can tell from the first glance that Johnny is a pro when it comes to car interiors – this could just as easily be a photo!*

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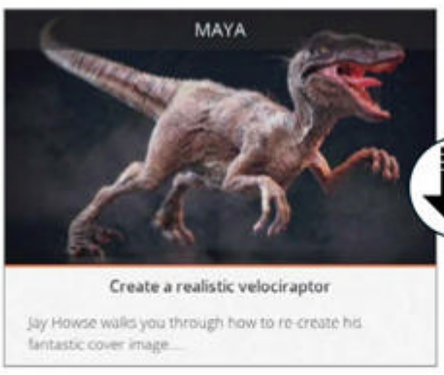

MAYA
Accelerating the character creation pipeline in Maya
The guys at Digital Tutors have been kind enough to provide this...

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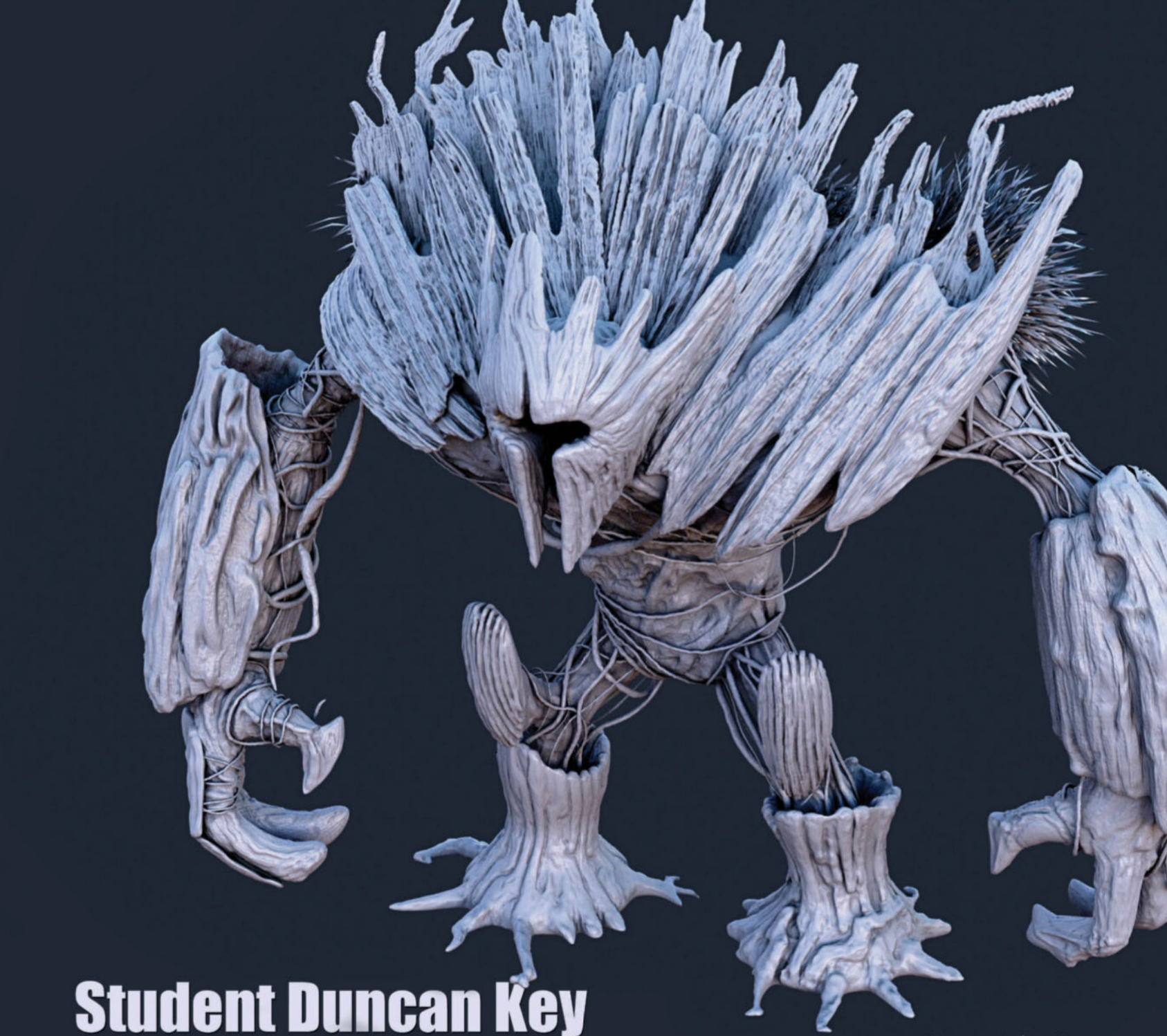
Astrid Busser-Casas
VFX Supervisor

THE FOUNDRY.



Student Duncan Key
MADE THIS IN WEEK 10!

Concept Designer
Grant Gosler

We're not sure which is cooler, the fact that Duncan made this in the 10th week of DAVE School (with no prior training) or the fact that this was the second ZBrush project assigned to his class! Our students benefit from being assigned carefully planned projects with expert instruction so they are doing amazing work right out of the gate!

They are provided with world-class designs from notable concept artists and shown professional techniques, but how they use their newly acquired skills is entirely up to them. The DAVE School never provides step-by-step instruction, we push the student to find their own way through a challenge, just like they will when they go to work at a studio.

And while we are proud of Duncan, he's by no means the only one. Check out our student galleries and you will see page after page of consistently great work from a wide variety of students! Our modeling program is common to both our 12-month **VFX Production** program and our 15-month course in **Game Production.**

DAVE SCHOOL

The Digital Animation & Visual Effects School

www.DaveSchool.com

The DAVE School is located on the backlot at **UNIVERSAL STUDIOS®** in Orlando, Florida!

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